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THE PALATINE ACCESS TO THE GANGLION SPHENOPALATINUM AND TO THE SECOND BRANCH OF THE TRIFACIAL NERVE

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In a communication made at a congress of German surgeons in Berlin in April, 1930, Braeucker pointed to several cases of trifacial-nerve neuralgia which could not be cured by an intracranial cutting of the stem beyond the gasserian ganglion, and in which the injection of alcohol into the ganglion semilunare failed to relieve pain, which, however, was subdued by injection into the ganglion sphenopalatinum. This type of neuralgia has been termed neuralgie sphenomaxilläre.

It has, therefore, been suggested that in similar cases surgical interference should not only be confined to separate branches of the trifacial nerve, the gasserian ganglion proper or behind it, but should involve the ganglion sphenopalatinum as well.

As a method of treating the above-mentioned disease, Braeucker has suggested removing the sphenopalatine ganglion with a simultaneous sectioning of the second branch of the n. trigemini. For this purpose he proposes a new access to the second branch of the trifacial nerve which also gives the possibility of removing the sphenopalatine ganglion.

There are several accesses to the n. maxillaris (Carnochamp, Fränkel, Gussenbauer, Friedländer, Kocher, Lücke, Poussep,[3] Braun, Krause-Lexer, Jonesko-Juvara). Besides the access to the g. sphenopalatinum, offered by Braeucker, there is one proposed by K. Vogel. The above-mentioned methods can be divided into three groups: (1) Access through the orbit; (2) access through the antrum of Highmore; (3) access through the zygomatic region.

In operations performed after these methods, either the inferior part of the orbit or the zygomatic bone or the zygoma is resected. In using the lateral access, some authors suggest either opening the antrum of Highmore or removing its posterior wall; others refrain from doing so.

The great depth at which the sphenopalatine ganglion lies and the possibility of injuring the facial nerve in applying all the above-mentioned

methods led Braeucker to modify the lateral access. Braeucker's idea is based on the fact that in his preparations there is a space (Lücke) between the zygomatic portion of the temporal and the facial nerve, generally free from nervous connections between the above branches. According to his method, the lower lateral part of the zygomatic bone is resected together with the plate of the anterior lower part of the zygomatic arch. Besides, part of the tuber maxillare is submucously removed. The a. transversa faciei is ligated as well as the chief stem of the a. maxillaris interna. The latter is ligated at a great depth and then sectioned. The author never mentions the venous plexus, which is situated in the pterygo palatine fossa.

Our investigations on cadavers have shown: (1) That it is extremely difficult to secure the integrity of the facial-nerve branches for, in using Braeucker's access, we failed to discover any space (Lücke) free from the said branches (Fig. 1); (2) that internal to the zygomatic arch there is a great quantity of fatty cellular tissue containing numerous blood-vessels; (3) that the sphenopalatine ganglion is laterally covered by the a. palatine descendens which greatly impedes the final separation and extraction of the ganglion; (4) and finally, the most important consideration is that in using the exterior access there can be no certainty of the ganglion sphenopalatinum being actually removed. Moreover, Hovelacque[2] also emphasizes that it is very difficult to distinguish the sphenopalatine ganglion amidst the abundant venous plexus in the region.

FIG. 1.—Facial-nerve ramification, formalin preparation (photograph).

All the above-mentioned considerations have led us to undertake, simultaneously with studying the type anatomy of the ganglion sphenopalatinum and its connections, the working out of a new access which in our opinion (1) fully guarantees the removal of the ganglion; (2) at the same time the method enables us to define all the connections of the ganglion and if necessary, to section them, and (3) it avoids injuring the facial-nerve branches, the cutting of large vessels and causing cosmetic defects. Our suggestion is to use the palatine access. Before describing our method we consider it necessary to state in brief the essential anatomical-topographical data referring to the ganglion based both on literature and on our investigations.

As the ganglion sphenopalatinum is situated in the pterygopalatine fossa, it is from the nasal cavity only that we are able to locate it, whether by anatomical investigation or by surgical interference.

The ganglion is separated from the nasal cavity only by the mucous membrane, the periosteum, and by a thin osseous plate connecting the superior maxillary bone and the anterior crest of the processus pterygoideus of the sphenoid bone. This osseous plate belongs to the lamina verticalis of the palate bone (Figs. 2 and 3). The ganglion directly adjoins the latter. The n. Vidianus, s.n. canalis pterygoidei and the n. sphenopalatinus proceeding from the second branch of the trifacial nerve pass into it (Fig. 4). The n.n. palatini major et minores, n.n. nasales branch off from the ganglion and run to the hard and soft palate and to the lateral wall of the nasal cavity. The a. palatina descendens generally adjoins the lower pole of the ganglion and the nerves descending from it, on the lateral side. Thus no macroscopic-

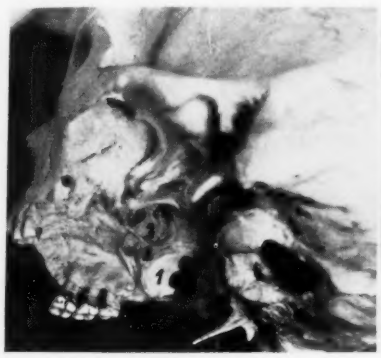

FIG. 2.

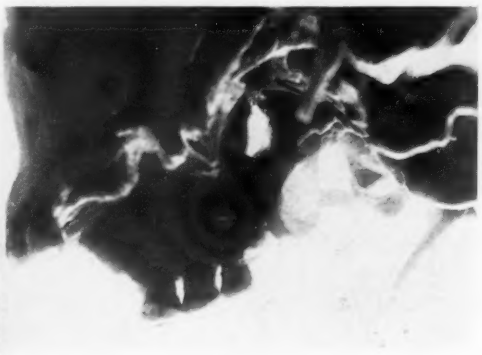

FIG. 3.

FIG. 2.—Cranium photographed from below and from the side: (1) Exterior plate of the right hamulus pterygoideus; (2) its interior plate; (3) vertical plate of the right palate bone (Fig. 3 marks the place where the bone is trephined for exposing the ganglion); (4) foramen sphenopalatinum of the right-hand side.
FIG. 3.—Same cranium as on Fig. 2 photographed with light from behind. Light spot of irregular shape in the middle of photo is the thin part of vertical plate of palate bone (marked 3 on Fig. 2).

ally visible vessels are observed between the above-mentioned vertical plate and the ganglion.

The anterior ridge of the pterygoideus process adjoins the ganglion from behind and the palatine nerves are separated posteriorly by a special groove on the anterior surface of the process.

The canalis pterygopalatinus leading from the pterygopalatine fossa into the oral cavity is funnel-shaped and opens into the hard palate through two or more orifices. The nerves as well as the a. palatina major (the terminal branch of the descending palatine artery) with corresponding veins run through the anterior and the largest of the orifices.

The ganglion is located almost at the very opening of the Vidian canal. At a distance of from three-quarter to one centimetre from this opening, the exterior part of the foramen rotundum is situated from where the second branch of the trifacial nerve enters the pterygopalatine fossa; at the place

of exit the said branch is directly adjacent to the lower lateral surface of the lateral wall of the sinus sphenoidalis where it gives off the n. sphenopalatinus which runs to the ganglion. Thus the ganglion might be described as a body with several processes directed posteriorly into the canalis pterygoideus, inferiorly into the canalis pterygopalatinus, laterally and superiorly to the

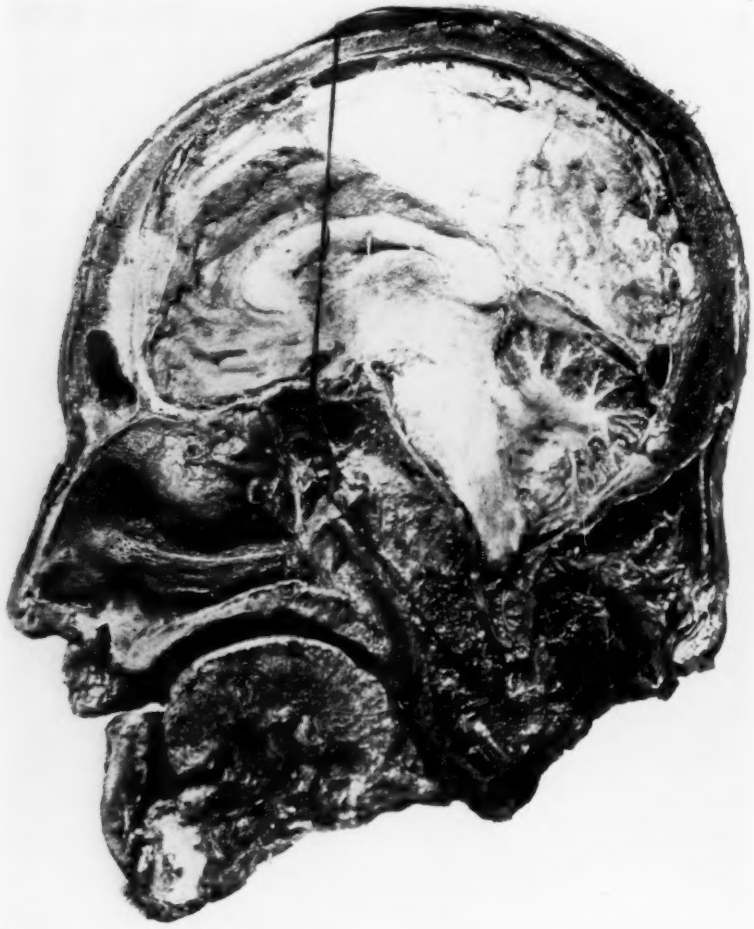

FIG. 4.—Sagittal section of head. Sinus sphenoidalis is exposed and a portion of its wall is removed for disclosing the second branch of the trifacial nerve held with a ligature (upper one). Mucous membrane of rhinopharynx together with periosteum is partially separated, a portion of the interior wall of canalis pterygopalatini being removed; Vidian nerve held with a ligature (lower one) and anteriorly from it the ganglion sphenonalatinum and nn. palatini (white stem going downward) are exposed. (Preparation preserved after Kaiserling. Photograph.)

second branch of the trifacial nerve and anteriorly into the foramen sphenopalatinum (into the nasal cavity) (Fig. 5). As a rule the ganglion is situated on the level corresponding to the posterior border of the palatine bone crista ethmoidalis, *i.e.*, to the posterior edge of the place where the concha nasalis media is attached to the lateral wall of the nasal cavity.

The above-stated anatomical data are sufficient to support the operative access we suggest, which consists of the following stages.

(1) The incision is made beginning at the posterior terminus of the alveolar process of the upper jaw to the terminus of the same process on the reverse side, running along its interior surface at a distance of two to three millimetres from the interior border of the gum and following around the foramen incisivum in the region of the middle incisor teeth (the type of incision being the same as in uranoplasty). The mucous membrane is separated together with the periosteum up to the very edge of the hard palate.

(2) The posterior edge of the hard palate on the side which is being operated is removed. For the purpose of widening the access, in the event of a narrow palate, the posterior part of the vomer and part of the palatum durum of the opposite side may

FIG. 5.—Sagittal section of cranium treated with acetic acid. Portion of wall of sinus sphenoidalis is removed as well as the interior wall of Vidian canal and the canalis pterygopalatini. (1) Second branch of the trifacial nerve translucent through the exterior wall of the sinus; (2) n. sphenopalatinus; (3) Vidian nerve; (4) ganglion sphenopalatinum; (5) nn. palatini. (Photograph.)

also be removed submucously, while the edges of the large palatial foramina (foramina palatina majora) on both sides are left intact.

(3) The mucous membrane of the bottom of the nasal cavity is incised on the operated side. If the palate is narrow the incision can be prolonged to the second half of the palate. The posterior part of the nasal partition can be removed. Thereby the first stage of the operation, namely, the penetration into the nasal cavity and the rhinopharynx through the mouth, is accomplished. (Fig. 6.)

(4) An incision of the mucous membrane on the lateral wall of the nasal cavity is made beginning somewhat higher than the posterior edge of concha nasalis media and descending to the level of the large palatine foramen. The mucous membrane together with the periosteum is separated from the palatine bone and the interior plate of the sphenoid process.

(5) The uppermost part of the inner wall of the sphenopalatine canal (part of the vertical plate of the palatine bone) is removed with a narrow gouge. Here it is necessary to recognize at the posterior edge, the point of junction of the concha nasalis media. The ganglion lies directly under the periosteum of the exterior surface of the vertical plate. It is advisable to exert a slight pull on the detached palatine flap to make sure that the sphenopalatine canal is opened. This produces a tension in the vascular nervous fasciculus (n.n. palatini and a palatina descendens) which results in the ganglion being drawn forward.

(6) The Vidian nerve is then exposed. For this purpose it is advisable to remove the lower part of the anterior wall of the Vidian canal, *i.e.*, the upper part of the anterior crest of the sphenoid process.

(7) Having caught hold of the Vidian nerve and the n. palatinus major by means of a squint hook (or a provisional ligature), we expose the ganglion which is removed

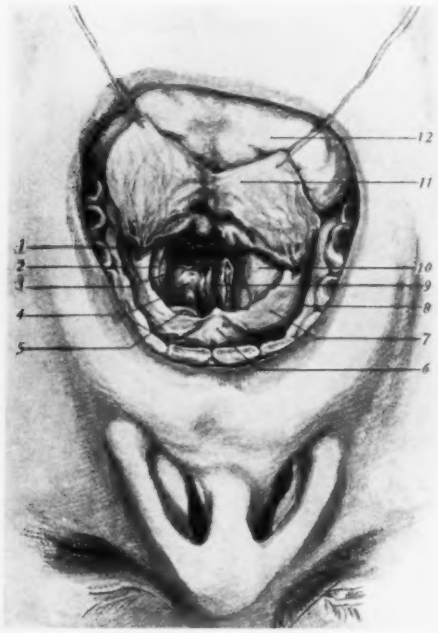

FIG. 6.

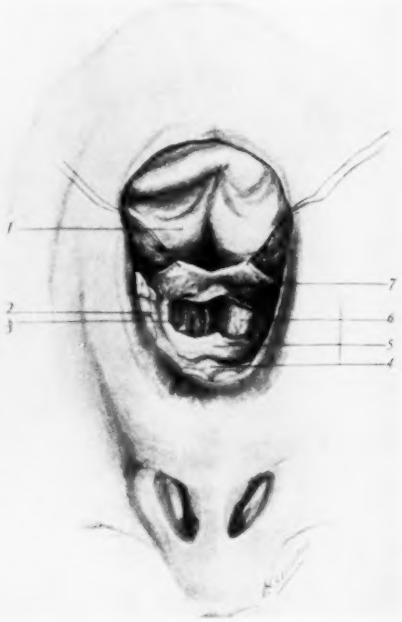

FIG. 7.

FIG. 6.—Operation of exposing ganglion sphenopalatini when using palatial access. (1) Hard palate nervous vascular plexus; (2) mucous membrane of lateral wall of nasal cavity; (3) portion of osseous wall of nasal cavity to be trephined; (4) median concha nasalis; (5) inferior concha nasalis; (6) portion of hard palate mucous membrane left in its place after incision; (7) hard palate osseous part of the right-hand side; (8) mucous membrane of gum; (9) nasal partition (partially resected); (10) mucous membrane of the right side nasal cavity basis; (11) soft tissue flap separated from hard palate; (12) tongue. (Photographed design of preparation.)

FIG. 7.—Exposing of the Vidian nerve and of the second branch of the trifacial nerve when applying palate access: (1) Tongue; (2) Vidian nerve with the ganglion sphenopalatinum; (3) second branch of the trifacial nerve; (4) part of the mucous membrane of the hard palate left after incision; (5) osseous part of the hard palate; (6) mucous membrane of the bottom of the nasal cavity; (7) flap of soft tissue separated from the hard palate. (Photographed design of preparation.)

together with a portion of the Vidian nerve and the n.n. sphenopalatini and palatinorum.

If there is no need to resect the second branch of the trifacial nerve, the operation can be considered completed at this point. If it is decided to resect the second branch of the trifacial nerve as well, then:

(8) The sinus sphenoidalis is opened from beneath and the lateral wall of the sinus is then excised in small portions in the anteroposterior direction. Part of the sphenoid process must be removed as well. Thus an adequate access to the second branch is

secured (Fig. 7). The latter is picked up by means of a squint hook and pulled medially and the required resection made.

The operation is completed as follows: (1) The mucous membrane of the lateral wall of the nasal cavity is set in place; (2) sutures are applied to the mucous membrane along the bottom of the nasal cavity; (3) the palatine flap is likewise set in place. An immobilizing device with a celluloid plate after Schroeder's method should then be applied. In case of it not being available, the palatine flap is fixed by sutures.

During the operation the patient is placed in Rose's position or one similar to it. As a source of light we used an ordinary electric bulb which is placed over the surgeon's head. The use of a forehead reflector still further simplifies the problem of providing sufficient light. We consider that the operation can be successfully performed under local anæsthesia. A strong solution of cocaine is applied to the nasal cavity with adrenalin solution added to it as a preventive against hæmorrhage from the mucous membrane; the mucous membrane of the palate is infiltrated with novocaine and adrenalin solution. While manipulating on the nervous stems either novocaine or cocaine can be applied.

As can be seen from the description of the access, the operation, in spite of its apparent complexity, is easy and simple to perform, though it involves the necessity of working at a comparatively considerable depth. This access has considerable advantages over other methods as the trauma inflicted is very small and there is no danger of the face being disfigured. The experience of Prof. Limberg's clinic, based on over 260 cases of radical uranoplastic operations on the cleft palate, convinces us of the fact that the results obtained by manipulations on the hard or soft palate are highly satisfactory with respect to healing and the post-operative course. A very important factor characterizing our method of access is the fact that from the moment the pterygopalatine fossa has been exposed the surgeon has a full view of the sought-for ganglion, which is removed together with the above-mentioned nerves the better to ensure success. It is also necessary to point out that the blood-vessels and venous plexus, which greatly complicate the operation in cases when the exterior access is used, remain outside the operative field in our method.

When manipulating on the external wall of the sinus sphenoidalis, it is of importance not to deviate too far posteriorly as in the latter case it is possible to penetrate into the median cranial fossa. For purposes of orientation it should be borne in mind that the orifice called the foramen rotundum is actually but a small canal and the distance between its inlet, which is situated in the median cranial fossa, and its outlet which can be seen on the side of the pterygopalatine fossa, does not exceed five millimetres.

Our measurements have shown that the distance from the edge of the hard palate to the ganglion sphenopalatinum and the Vidian nerve does not exceed 2.5 to 3 centimetres, and the distance to the second branch of the trifacial nerve is 3.5 to 4 centimetres. In Braeucker's facial access, as pointed out by the author himself, the distance from the zygomatic bone to the canalis pterygoideus is equal to 5 to 6 centimetres.

According to P. Bogoslovsky's[4] investigations, all crania can be divided into four groups according to their palatine index, $\frac{\text{height} \times 100}{\text{width}}$. He measures the width of the palate at the level of the first molar teeth and the height in the highest part of the palate along the median line. Platystaphylines (the true flat-palated type) index under 30; the mesostaphylines with an index varying from 30 to 40; semiflat palated crania with an index from 30 to 35 and semihigh palated crania with an index from 35 to 40 should be distinguished in this group; to the last group belong the hypsistaphylines (the true high-palated type) with an index over 40.

In addition to these observations it is necessary to mention the investigations carried out by Kuprianov[5] who has studied the type anatomy of the basis cranii externa. He has found that the angle formed by the lines connecting the foramen incisivum of the hard palate and the foramen stylomastoideum (the so-called Scott's lineæ foraminiferæ) varies within the limits of from 40° to 53° and is usually smaller in the dolichocephalics and larger in the brachycephalics.

Our observations show that in the access to the ganglion sphenopalatinum and the second branch of the trifacial nerve a wide and flat palate allows a larger angle for operating while a narrow and high palate allows a smaller one.

In conclusion, we find it necessary to note that the palatial access to the epipharynx we have suggested can be also applied to approach the hypophysis cerebri.

Our access was worked out on cadaver material and has already been applied to man by otorhinolaryngologists who have availed themselves of the proposed method for surgical treatment of choanial atresia. Thus a similar operation was described by Steinzeug,[6] and a case of choanial atresia operated upon after this method which gave excellent results.

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MEDIASTINAL GANGLIONEUROMA

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Case.—Girl, aged seven and one-half years, was admitted to Roosevelt Hospital, November 1, 1930, with complaints of cough and fever, of one and a half years' duration. These symptoms occurred in attacks in which the patient coughed until breathless, raising a small amount of sputum. There was no vomiting, no night sweats, no loss of weight. The past history was negative. She had been immunized against diphtheria and vaccinated against small-pox. The present attack began two days before admission and

Fig. 1.—X-ray, November 3, a shadow with a sharp convex external margin is seen in the extreme upper portion of the right lung field. Trachea is displaced to the left.

was accompanied by fever, ranging from 99° to 104°. On examination the only positive findings were dry, squeaking râles over the entire chest. There was no evidence of consolidation.

X-ray of the chest taken November 3 demonstrated a circular shadow of increased density occupying the extreme upper portion of the right lung field. The trachea was displaced to the left. A lateral view showed an anteroposterior diameter greater than that found in the posterior-anterior film. (Fig. 1.)

Physical examination in this zone showed increased dullness and decreased breath

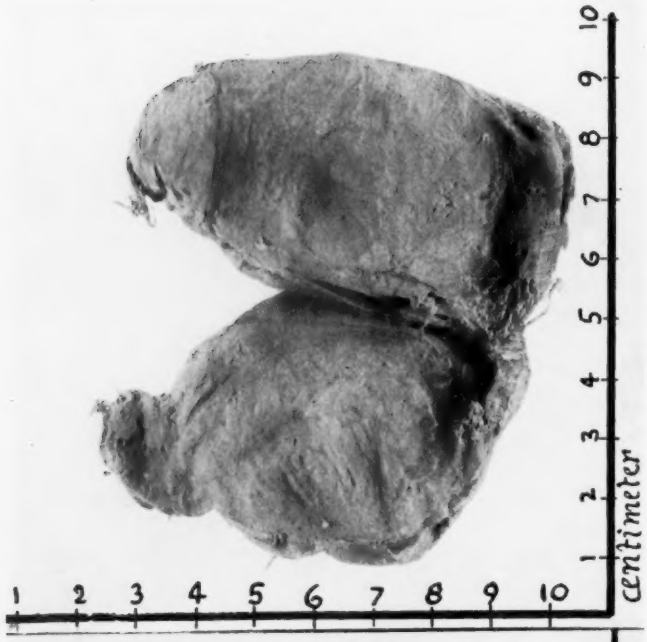

FIG. 3.—Cut surface showing distinct fibrous markings.

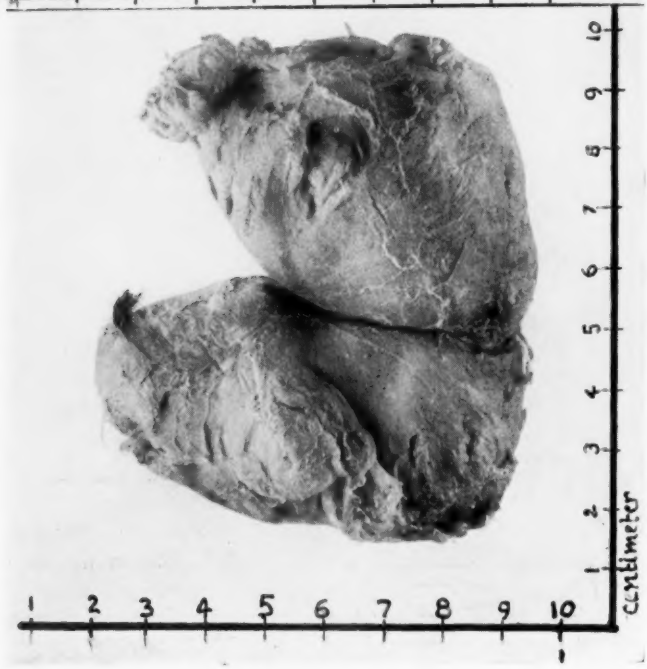

FIG. 2.—Gross specimen showing capsule with projecting tabs.

sounds, high on the posterior aspect of the right side of the chest, beginning one inch below the spine of the scapular and extending over the apex of the lung to the second interspace anteriorly.

Blood examination revealed red blood-cells 4,300,000; hæmoglobin 65 per cent.; white blood cells on several examinations varied between 6,300 and 16,700 of which, in the latter count, 81 per cent. were polynuclear neutrophils.

November 14, 1930, operation was undertaken under intratracheal anæsthesia by Dr. J. I. Russell. A large hypodermic needle was first introduced into the back over the estimated position of the tumor and an attempt was made to aspirate, in order to exclude the presence of a cyst. No material could be obtained except a small amount of blood. Following this, an incision was made obliquely from the first rib near the midline posteriorly, downward and outward across the third rib. The second, third and fourth

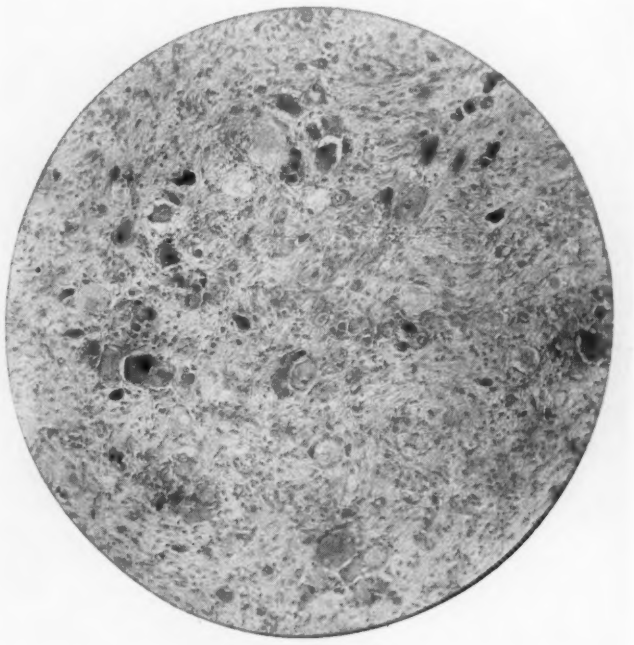

FIG. 4.—Microscopic (X-125), showing numerous ganglion cells of irregular form, some with multiple nuclei. The stroma is loose and fibrillary in some areas and densely fibrous in others.

ribs were exposed after separation of the trapezius and rhomboid muscles and the third rib was resected. The tumor was exposed and found to be extrapleural. On account of its size it was then found necessary to resect the second and fourth ribs. The incision was then enlarged, through the periosteum and subcutaneous tissue and the lung exposed. The tumor appeared to be about 3½ by 2 inches and encapsulated. By gradual finger dissection it was brought into the wound and raised from the mediastinal cavity. A small pedicle was found attaching it opposite the body of the second dorsal vertebra. This was divided. There was very slight bleeding. The pleura was torn at one point and immediately repaired. The lung did not collapse at any time, even when the positive pressure was withheld. The deep parts were closed with continuous catgut, the muscles with interrupted catgut and the skin with interrupted sutures of silk which were removed on the sixth day.

Pathological Examination.—The specimen (Fig. 2) was ovoid, weighed 150 Gm.

and measured 10 by 7 by 6 cm. The color was yellowish pink, and the capsule fibrous with a projection on one broad surface which came to a ragged point where an attachment had been cut. A rounded lobulation was noted on one surface. On section (Fig. 3) the cut surface was pinkish gray and showed fibrous markings, like a fibroma. The consistency was resilient and in the central portion occurred a small linear hæmorrhage (possibly caused by the needle puncture).

Microscopic examination (Fig. 4) revealed a stroma of small spindle cells scattered among a considerable amount of fibrillary substance. Very striking were the numerous large rounded and stellate cells which stained deeply with hematoxylin and presented rounded nuclei, frequently with one prominent nucleolus. These cells appeared sometimes grouped among delicate fibrillæ and surrounded by trabeculæ of denser supporting stroma.

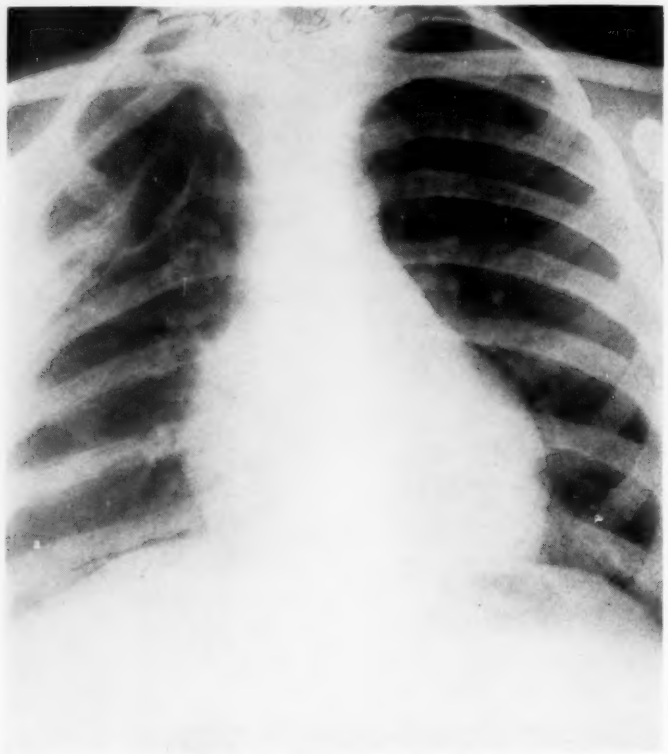

FIG. 5.—X-ray of chest on April 29, 1933, without evidence of recurrence.

Some foci consisted of non-nucleated rounded or tubular masses 20 to 30 micra in diameter staining with eosin. By the Weigart method these appeared to be myelin. There were also some foci of fat with necrosis, calcification and giant-cell formation of the foreign body type. In such zones could be seen clusters of lymphocytes. Diagnosis.—*Ganglioneuroma.*

Post-operative Course.—X-ray November 25 showed a definite fluid level in the cavity from which the tumor had been removed. The heart and trachea were in the midline. December 19, the shadow in the right upper lung field was considerably reduced and the fluid line was absent. The shadow assumed an irregular outline and diminished in size on subsequent examination January 3, 1931. The patient was discharged in excellent physical condition on this date. The postoperative course was smooth with fever diminishing after ten days and remaining normal. On subsequent examinations the physical condition was found excellent. X-ray April 29, 1933, showed no evidence of recurrence, the lung tissue filling in the right apex completely. (Fig. 5.)

COMMENT.—*Occurrence.* Ganglioneuroma has been observed in various portions of the central and peripheral nervous systems and in connection with outlying sympathetic ganglia, mainly in the adrenal gland, carotid body, coccygeal gland and Zuckerkandl's organ. A few cases have occurred in the cerebral hemispheres and a number have been subcutaneous.

The first reported case was that of Loretz in 1870, arising in a prevertebral ganglion. The number of known cases has increased rapidly during the past twenty years. In 1924 Brunner[1] could collect only fifty-one cases to which he added an operated mediastinal case of his own. In 1931 in reporting an additional case, McFarland[2] tabulated references to ninety-three reported cases, under the anatomical subdivision, central nervous system, cranial nerves and roots, neck, thorax, abdomen and peripheral nerves. The abdominal group includes alimentary, adrenal, retroperitoneal (the most numerous) and pelvic.

A recent review by Bigler and Hoyne[3] carried the total number to ninety-seven. Since then cases have been added by Haven and Weil[4], Jergesen[5] and by Schliefstein[6]. A majority of the reported cases have been accidentally discovered during the course of routine autopsy examinations.

The age distribution includes infancy and old age, but a striking number of cases below sixteen makes the condition of especial interest to the pediatrist. Of their ninety-seven, Bigler and Hoyne[3] found forty-one fell into this age group. A definite preponderance of females is also apparent.

Histogenesis.—Ganglioneuroma is the most adult variety of a series of tumors formed by primitive cells of the nervous system. The most primitive cell, the neuroblast, sympathicoblast or neurocyte, is an undifferentiated, round cell with little cytoplasm, resembling on casual examination a lymphocyte, but identified by the formation of neurofibrils and rosettes, and by an extremely active malignant growth potentiality. Some cells of this type may at times be found in a ganglioneuroma, and presumably account for the malignant varieties of this tumor. A remarkable example of the relationship between the sympathicoblastoma, the common malignant tumor of the adrenal medulla in infants, and the ganglioneuroma is that of Cushing and Wolbach[7]. They observed a malignant sympathicoblastoma of the paravertebral region in a one year old infant. A recurrence removed at the age of eleven years revealed a transformation of this tumor into a benign ganglioneuroma. This is perhaps another point in favor of regarding these tumors as embryonal rests or misplaced tissue with limited capacity for aberrant growth, the type of tumor called hamartoma by Allbrecht.

The mature ganglioneuroma presents a very striking histologic appearance well described by Wahl[9], Stout[8] and others. The stroma varies from delicate loose fibrils to firm collagenous fibrous tissue. The ganglion cells may be unipolar, bipolar or multipolar, may or may not contain tigroid granules and frequently have more than one nucleus. Unmyelinated nerve fibers are very numerous, but myelin also occurs. The ganglion cells are

usually grouped together. Evidence of necrosis is usually found in some foci. Occasionally, there are groups of neurocytes.

Surgical Anatomy.—Arising in and developing along the cranial nerves and the cervical, thoracic and retroperitoneal sympathetic trunks, the anatomic relationships of a ganglioneuroma are conditioned to a great degree by the pre-existing structures in which it arises. Thus Stout[8] points out that in the region of the superior cervical ganglion, a ganglioneuroma will reach up to the region of the tonsil, push aside the tongue and extend up to the submaxillary fossa behind the mandible. Similarly in the neck the tumor is usually between the carotid artery and the jugular vein and is always in front of the vagus nerve. In the thorax, ganglioneuroma extends from the bodies of the vertebræ forward and away from the midline, pushing the parietal pleura in front of it and not invading the lung. There is sometimes an extension through an intervertebral foramen and an invasion of the spinal canal with pressure on the spinal cord. The outline seen in the *x*-ray is usually ovoid with a flattened medial aspect facing the vertebral bodies and a sharply defined convex lateral border which may reach a greater or lesser distance toward the parietes. This outer border is usually very well defined. The density is homogeneous throughout.

Degree of Malignancy.—The great majority of ganglioneuromata appear to be completely benign neoplasms. The growth is usually slow. Riggs and Good's[11] case showed no change in size in *x*-rays taken over a course of over a year. Some cases have grown rather rapidly. McFarland's case attained a size of 4½ pounds in a year's clinical observation.

The capsule is usually incomplete and on this account the surgical removal may leave small portions of the tumor behind. Busse-Kredel (quoted by Brunner[1]) was obliged in his case to leave a small portion of tumor and on subsequent observation found that this was completely absorbed. In our case the projections from the capsule were transected and no clear-cut dissection was possible, yet the small portions left behind have showed no growth activity.

Malignant types of this tumor have been reported. Brunner[1] quotes a case reported by Beneke in 1901 occurring in a ten year old female, in which metastases developed. A similar malignant variety (degeneration would be an unjustified term, since the cell type is probably primarily either benign or malignant) was that of Berner[11] a four and one-half year old female with metastases of ganglion cells and neurofibroma stroma in the regional lymph nodes.

Prognosis.—In the collected cases of Bigler and Hoyne[3], there are thirty-nine operated cases. Of these, twenty-five were in children, with twenty reported as cured. Of the fourteen adult cases, all were cured. The mediastinal cases in the same series numbered ten, of which half were in children. Five of these cases were operated upon (four were children) and three were pronounced cured. Our case is therefore to be placed in this small group of cured mediastinal cases.

A variety of operative and postoperative complications and sequelæ are to be considered. In the neck, the occurrence of paralysis of the cervical sympathetic nerve is to be expected from its close anatomic connection with the tumor. This occurred in Lillienthal's[12] case and in one of Stout's[8], resulting in the development of Horner's syndrome. Brunner's[1] case required several reoperations and transpleural approach, and was complicated by gangrene of the lung. An extensive thoracoplasty was necessary. The deep-seated position of these tumors and their frequent proximity to large vessels make hæmorrhage another serious factor.

It should also be pointed out that a number of cases have showed the presence of multiple tumors, sometimes widely distributed. In one such case the removal of all the observed tumors was successful.[4]

A definite prognostic value exists in the recognition of this tumor, because of its benign course, as contrasted with the marked tendency to recurrence and malignant development of neurogenic fibroma, a tumor of similar gross and, when inadequately examined, microscopic appearance, occurring in similar anatomic structures.

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NEUROFIBROMA OF THE HYPOGLOSSAL NERVE

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NEUROFIBROMATOSIS may be found scattered over many different parts of the nervous system. Multiple tumors often in great number are found in the meninges as well as the peripheral nerves, while single tumors are more common in the deeper nerve trunks as well as the cranial nerves. Of the cranials, the acoustic is the most frequent site, while cases have been reported of the vagus, of the cervical sympathetic, and spinal accessory nerves. In the visceral form, these growths have been reported as occurring in the tongue, stomach, jejunum, ileum, colon, vagina and bladder. (Walter E. Dandy, p. 667, Lewis Practice of Surgery, vol. 12.)

The following is a report of a case of neurofibroma of the right hypoglossal nerve. So far as I know, this is the first case on record. It is quite interesting to note that while the growth was of considerable size, occupying more than two-thirds of the proximal portion of the nerve as it emerges from the cranium, it was absolutely symptomless so far as motor function disturbance. Evidently, the few fibres that were left were sufficient to carry on motor function. Soon after resection, however, motor function on that side was entirely interfered with, and atrophy of the right side of the tongue was soon evidenced.

CASE REPORT.—M. S., female, aged thirty. For the past one and one-half years, a slowly growing, painless swelling was noticed on the right side of the neck, at the angle of the jaw. Conscious of some difficulty in swallowing, no interference in mastication; did not notice at any time difference in the thickness or size of the right side of the tongue. At no time any motor disturbance of tongue, or any deviation of tongue when protruded. No interference with speech. Examination showed considerable enlargement of right side of the neck (Fig. 1), caused by a mass occupying entire superior carotid triangle, smooth and globular, the lower boundary reaching to about the middle of the sternomastoid. The mass is felt beneath the sternomastoid, cystic in character, painless and sufficiently large to cause definite bulging of the pharynx and tonsil toward the median line. Pressure on the outside of the mass with the mouth open shows very decidedly the dislocated tonsil and pharynx toward the mid-line. Diagnosis was not made; the probable diagnosis being a large branchial cyst or aberrant thyroid.

Operation.—Avertin anæsthesia, incision from the angle of the jaw parallel with the edge of the sternomastoid, four and a half inches long. Sternomastoid retracted, incision continued down to tumor. The entire tumor easily separated from the surrounding structures and shelled out of its bed, after carefully separating it from the carotid sheath, its upper limit tapering far up into the neck to about the level of the transverse process of the second cervical vertebra, which was distinctly felt. The sheath of the nerve at its extreme upper limit was thinned out and here tied and cut, the entire mass delivered,

and, upon doing so, the rounded lower portion of the mass was found to be continuous with a cord-like structure which was identified as the hypoglossal nerve. A portion of the normal nerve was removed with the tumor. The tumor occupied that portion of the nerve nearest to its exit from the skull to about where the nerve normally crosses the tendon of the digastric muscle. At this point the nerve became abruptly normal, that is, at its junction with the globular-shaped, distended part of the tumor. During the removal of the tumor, the cystic portion ruptured, a clear fluid escaping; the rest of the mass consisted of a semi-soft gelatinous-like structure. The operation lasted thirty-five minutes, the patient having an uneventful recovery.

Two days after operation, there was pronounced evidence of atrophy of the right

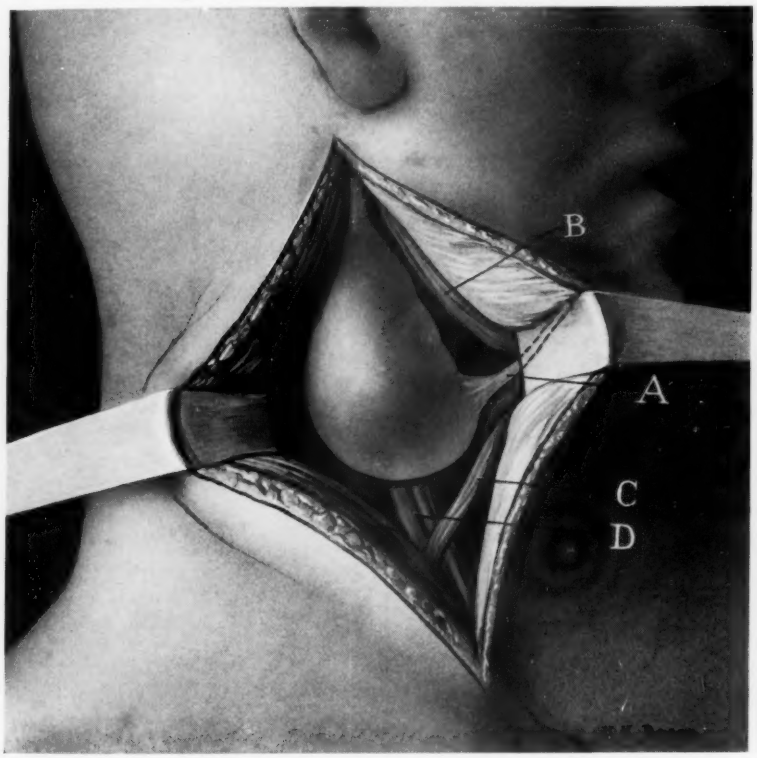

FIG. 1.—Showing neurofibroma of the hypoglossal nerve. (A) Normal part of the hypoglossal nerve. (B) Posterior belly of the digastric. (C) Omohyoid. (D) Deep vessels of the neck.

side of the tongue. (Fig. 2.) The patient complained of some difficulty in managing food on the right side of the buccal cavity. There was some interference with speech for a few days; sensation was normal. When the tongue was protruded, there was deviation toward the right (affected side) while the tip curves to the left side. The raphé formed a distinct curve, the concavity being on the paralyzed side. No deviation was present when the tongue was not protruded. After a month's time speech was normal and complete management of food was possible. Atrophy very decided.

Pathological Report.—Anatomical.—Specimen is a piece of tissue measuring five by three centimetres, one part of which is a cyst with a thin wall containing thin hæmorrhagic fluid. The upper part appears to be solid, has a yellowish fatty color and has the consistency of mucinous or gelatinous substance, but on section it has the appearance of firm fibrous tissue.

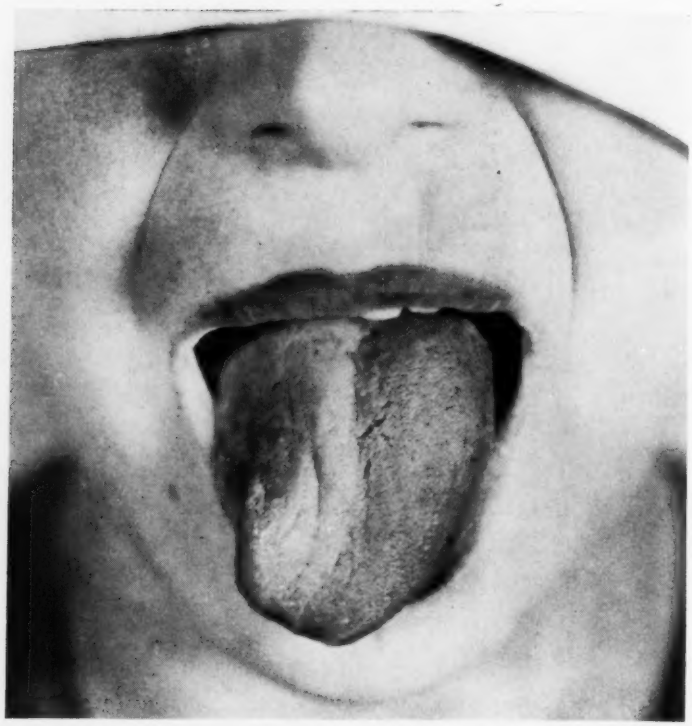

FIG. 2.—Showing atrophy and deviation of right half of tongue following resection of right hypoglossal nerve for neurofibroma.

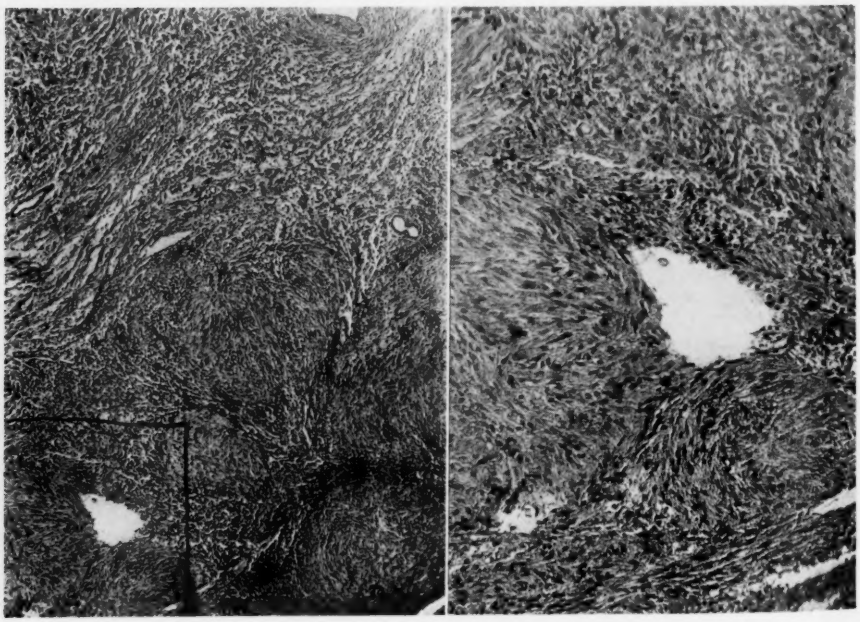

FIG. 3.—Low magnification of the tumor showing its general appearance.

FIG. 4.—Higher magnification (x145) of the area marked off in Fig. 3. The characteristic structure is well shown, including numerous fibrils and nuclei parallel to each other ("nuclei on parade").

Microscopical.—Sections show a very cellular structure with areas of œdema and several hæmorrhagic foci towards the periphery of the structure. Throughout the entire section there are seen areas of fatty degeneration. The tumor proper is composed of closely packed fibrils which in some places are parallel and in others perpendicular to each other. In places these are arranged in the form of palisades. Again there are several areas in which these cells are arranged around the small bundles of nerve fibres and here the tumor has an alveolated appearance.

Some Pathological Features of Neurofibromata.—Much water has flowed under the bridges since the Old Master of Pathology, Virchow, spoke of "true" and "false" neuromas, designating the tumors composed of nerve structures proper—axis, cylinder and myelin sheath—as true neuromata, and those composed of connective tissue as the false. While the division of neuromata into "true" and "false" may not have led to so much confusion and nomenclatural chaos and welter as was created by leukemias and pseudo-leukemias with their crowning achievement of "true pseudo-leukemia"—true false leukemia—nevertheless an attempt can be made to separate the two neuromata on the basis of their histogenesis, and a very brief review of histological data may not be out of place.

In the structure of a nerve fibre, we have the following elements: (1) The ordinary loose connective tissue: the epineurium which envelops the entire nerve, the perineurium which surrounds each bundle of nerve fibres, and the endoneurium which ensheathes individual nerve fibres. (2) The nerve tissue proper as found in the axis cylinders and myelin sheaths. (3) The neuroglia—the supporting nerve tissue—the cells of the sheath of Schwann.

It is obvious that the tumors derived from (1) are genuine neuro-fibromata, *i.e.*, fibromata of the nerve, just as we have fibromata of the uterus, *etc.* It is equally obvious that the tumors composed of the nerve tissue proper from (2) are neuromata. But what of the tumors composed of neuroglia which is also, embryologically, a nerve tissue, *i.e.*, is derived from the ectoderm (with the exception of the mesoglia of Hortega which is a mesodermal tissue)? Naturally, they must be regarded as neuromata, and, as a matter of fact, in the central nervous system, they are the well-known group of gliomata. It is becoming quite clearly established that pure fibromas, just as pure neuromas and pure gliomas of nerve fibres are very rare and that most of these tumors reported are composed of both connective tissue and of the cells of the sheath of Schwann, and it would be, therefore, desirable to give a new name to these combined tumors, since it is now definitely accepted that the cells of the sheath of Schwann are neuroglia cells.

Such a name has been coined by Verocay.* In discussing these tumors under the name of "neurinoma," Verocay has pointed out that practically all such tumors are derived from the cells of the sheath Schwann (Schwannoma) and are, therefore, ectodermal, not mesodermal, tumors

* Verocay: Ziegler's Beitr., vol. 48, p. 1, 1910.

(even though the neighboring connective tissue participates, to a very limited degree, in the growth). He has further pointed out that these tumors, when stained by the Von Gieson method, do not stain red, but are yellow, and are composed of netlike bundles of fibres (plexiform), with the nuclei frequently in parallel rows ("nuclei on parade," Askanazy). It must be added, however, that several authentic cases of pure fibromata of the nerves (Harbitz, Wegelin, Kaufmann, Ribbert, Antoni) have been reported. The von Recklinghausen disease does not present a constant picture since some cases are pure neuromata while others are pure fibromata.

It is of importance to bear in mind that while a great majority of neurinomas are benign, they may assume sarcomatous properties and that many of the so-called "neurogenic sarcomata" probably belong to what is still described as "neurofibromata." Occasionally, as in our case, the tumor may be cystic.

BLEEDING MALIGNANT POLYPOID LESIONS IN THE CARDIA OF THE STOMACH

ASSOCIATED WITH SEVERE ANEMIA: REPORT OF THREE CASES

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The difficulty sometimes encountered in distinguishing the condition produced by a malignant lesion situated in the cardia of the stomach, from pernicious anemia, is well known. The history of the illness, the appearance of the patient, analysis of gastric content, and studies of the blood may be of little aid in determining the basic pathologic change. In addition, roentgenographic visualization of tumors in this portion of the stomach is far more difficult than when the lesions extend distal to the incisura. Definite exclusion of any possible source of bleeding in the stomach is imperative prior to the solitary diagnosis of primary anemia. The occasional occurrence of a bleeding malignant lesion in the cardia, associated with the typical hematologic picture of primary anemia, and including, perhaps, secondary neurologic changes, renders detection of gastric changes essential to the most intelligent care of the patient. Occasionally a bleeding, benign gastric tumor may have a similar picture and, prior to surgical exploration, may be indistinguishable clinically from a malignant growth.

Regardless of how long treatment with liver or liver extract is continued in cases of this type, even when temporary improvement in the blood picture takes place, cure, of course, is impossible if the gastric neoplasm is not removed. This cannot be overemphasized, for occasionally a surgeon may hesitate to operate on a particularly debilitated patient who presents all the classic features of primary anemia, but who, in addition, harbors a small gastric polyp. Even though roentgenologic evidence favors a benign gastric lesion, positive knowledge of the true nature of the growth is not available prior to operation. Current methods for preoperative preparation will reduce materially the risk of operation for the most enfeebled patient. Although the true etiology of pernicious anemia remains in doubt, patients deserve the benefit of removal of any source of chronic hemorrhage, even though the lesion might subsequently prove to be benign.

Tumors situated in the proximal portion of the stomach frequently require different surgical treatment from those in the region of the pyloric antrum. A left rectus incision increases the accessibility of proximal growths to a marked degree. Although the Polya type of operation or the Billroth II procedure is usually desirable when resecting a malignant lesion in the distal

portion of the stomach, these methods do not lend themselves so readily to the removal of growths originating in the cardia. The procedure of choice for lesions in this situation varies with the extent, position and nature of the tumor. Pedunculated lesions arising on the posterior wall may be removed easily by transgastric excision. A more extensive, less pedunculated lesion on either wall may lend itself to excision by means of sleeve resection. A lesion high on the lesser curvature may sometimes best be extirpated by local excision.

Opinions differ as to whether pernicious anemia and carcinoma of the stomach may be present simultaneously, or whether carcinoma of the stomach will produce merely the blood picture of pernicious anemia or the whole clinical syndrome of this disease. The symptoms and findings in the cases to be presented are explainable on a basis of pernicious anemia with combined sclerosis; in Cases I and III the fluoroscopic examination which is made as a routine when a diagnosis of pernicious anemia has been given, led to discovery of the tumor. In Case II fluoroscopic examination was particularly indicated because of the gross blood present on analysis of gastric content. This report adds three more cases to the group of eleven reported by Conner and Birkeland, in which the coëxistence of carcinoma and pernicious anemia was certain or almost certain.

Morphologic examination of blood smears is valuable in all cases of carcinoma with anemia in which there is a high color index. This finding alone should suggest special examination of the blood smear, attention being directed to the presence of macrocytes well filled with hemoglobin, and to hypersegmentation of the nucleus of the neutrophil, or so-called shift to the right. Although this morphologic picture is not absolutely diagnostic of pernicious anemia, other diseases which cause it occur relatively rarely in this region of the country. In all cases macrocytosis was discovered, but in Case I the neutrophils did not reveal any change in lobulation. When an actively bleeding lesion is present, in addition to pernicious anemia, there may be additional influence on the bone marrow which, in cases in which treatment has been given, could rise to an hypochromic type of anemia.

Treatment in cases in which combined sclerosis is associated is especially important, for it is well recognized that neurologic symptoms may increase rapidly if treatment is withdrawn for as short a period as two to three weeks. The pernicious anemia should be treated continuously before, as well as during, the time necessary for caring for the gastric lesion. Oral treatment should be continued as long as possible, and when necessary, intramuscular, subcutaneous, or intravenous treatment may be used instead. With the advent of solutions of liver extract for intravenous use, which cause practically no reaction, a valuable aid was furnished, particularly during the postoperative course, when intramuscular treatment might cause discomfort to the patient and oral treatment might be unwise or impossible.

CASE I.—A married woman, aged sixty years, registered at the clinic January 25, 1933, with a history of progressive weakness of both legs for the last two years. During the

months just preceding her admission, great difficulty in walking had developed. There had been, also, some loss of sensation in the lower extremities. No gastro-intestinal symptoms had been noted except some gaseous indigestion and recent constipation.

The patient was pale and weak, and unable to rise from the chair. Her tongue was smooth and glossy. Her lower extremities gave evidence of combined sclerosis of the spinal cord. The concentration of hemoglobin was 11.7 Gm. in each 100 cc. of blood; erythrocytes numbered 2,600,000 in each cmm. Analysis of gastric content did not reveal free hydrochloric acid; total acidity was 6, in terms of cc. of tenth normal sodium hydroxide, and the amount of blood was graded 4. A roentgenogram of the stomach disclosed a tumor about 5 cm. in diameter, on the posterior wall, near the cardia.

At operation, following several days of preparation in the hospital, a carcinomatous polyp (Fig. 1) was found attached by a broad pedicle to the posterior wall and lesser

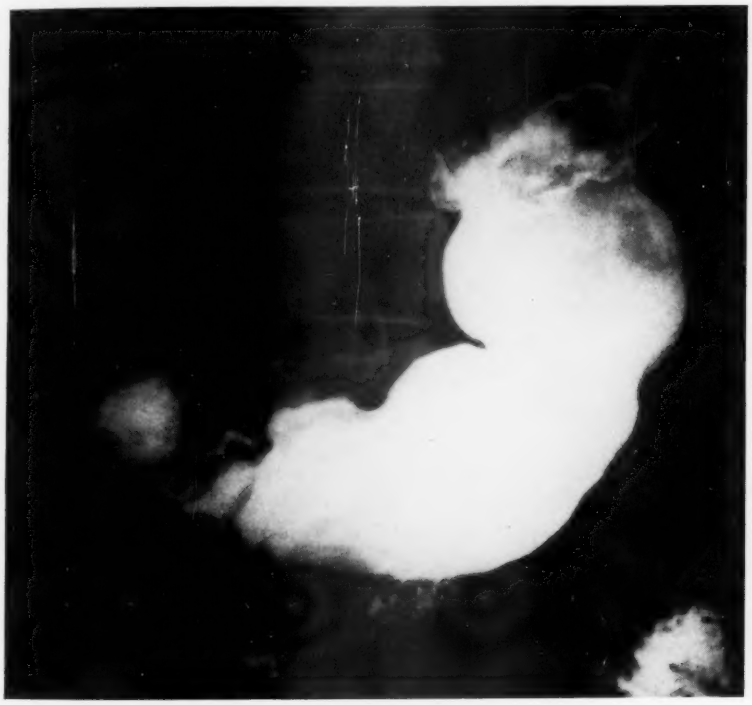

FIG. 1.—(Case I.) Roentgenographic appearance of the stomach.

curvature of the cardiac portion of the stomach. Lymph nodes were not involved, and transgastric excision of the tumor was performed with the cautery. The region of attachment of the growth was thoroughly cauterized and closed from within. The incision in the anterior wall of the stomach was closed with three rows of chromic catgut. The stomach was then rotated laterally and the line of suture in the posterior wall was reinforced on the serosal side with a double strand of chromic catgut.

The patient's convalescence was rather slow, but satisfactory. Intramuscular injections of liver extract were started on the fifteenth day after operation. On dismissal, the concentration of hemoglobin was 12.6 mg. in each 100 cc.; erythrocytes numbered 3,780,000 and the leukocytes 5,900 in each cmm. of blood.

CASE II.—A farmer, aged fifty-four years, registered at the clinic October 3, 1932, complaining of weakness, gaseous indigestion and intermittent diarrhea, all of two years' duration. One year previously, he had noted a sore tongue and recently some "tingling"

in the feet. The symptoms had progressed steadily. Treatment elsewhere with liver extract afforded only slight improvement. There had been a loss of twenty pounds in the last two years.

The patient was weak and markedly anemic; he weighed 140 pounds. His tongue was smooth and shiny. There was evidence of combined sclerosis with peripheral neuritis. The concentration of hemoglobin was 12.1 Gm.; erythrocytes numbered 3,100,000 and leukocytes 6,100. The blood picture was considered to be that of pernicious anemia. Repeated analyses of gastric content revealed no free hydrochloric acid and a total acidity ranging from four to ten. A polyp measuring approximately 2.5 cm. in diameter was discovered, by means of roentgenograms, on the lesser curvature of the stomach. A smaller polyp was seen adjacent to the larger one.

Following observation and preparation, operation revealed multiple gastric polyps proximal to the incisura (Fig. 2). Segmental resection was performed, and the portion

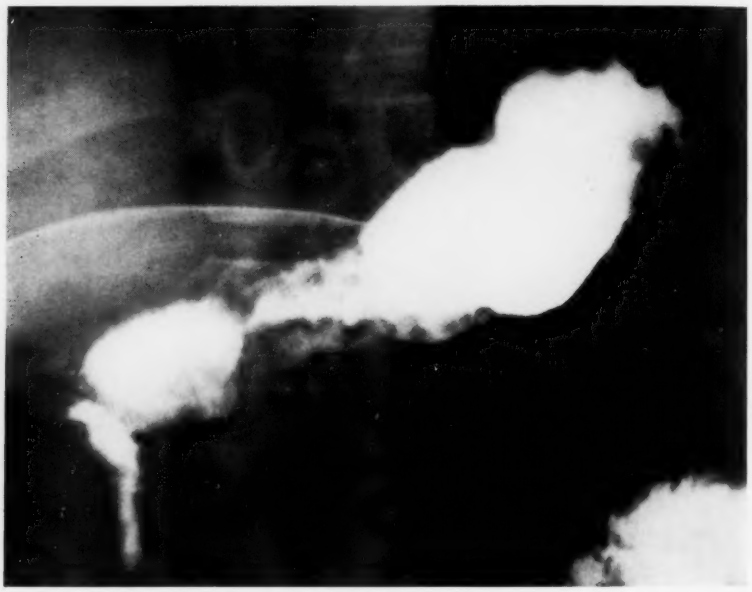

FIG. 2.—(Case II.) Roentgenographic appearance of the stomach.

of the stomach containing the polyps was removed. This type of operation seemed advisable because the general condition of the patient was not very good, and resection of the Pólya type could not have reached any higher on the stomach. Two polyps, one about 2.5 cm. in diameter, and the other about 0.5 cm. in diameter, adjacent to the first, were found. The polyps bled profusely on the slightest manipulation. The opening in the stomach was closed with three rows of chromic catgut. Microscopic examination revealed sessile, adenocarcinomatous polyps, graded 1.

Convalescence was prolonged by generalized weakness and thrombophlebitis of both legs. There was also some evidence of toxic nephritis. Treatment with liver extract was started three weeks after operation. At the time of the patient's dismissal from the hospital, the concentration of hemoglobin was 13.8 Gm. and erythrocytes numbered 3,400,000. When last heard from, the patient had definitely improved.

CASE III.—A man, aged forty-seven years, registered at the clinic in June, 1928, complaining of weakness and numbness of the legs of several months' duration. Examination revealed combined sclerosis typical of pernicious anemia. The concentration of hemoglobin was 45 per cent., erythrocytes numbered 2,300,000 and leukocytes 2,900.

Analysis of gastric content did not reveal free hydrochloric acid. Roentgenograms of the stomach were negative. The patient was dismissed with instructions to follow a regimen for primary anemia. He returned to the clinic December 2, 1931, complaining of severe constipation and gaseous indigestion of three months' duration. For one year following his previous visit he had adhered closely to the liver diet and had become entirely free of symptoms. He then had discontinued the diet until symptoms had developed three months before he returned to the clinic, when he had resumed the diet, but without relief.

The concentration of hemoglobin was 82 per cent. and erythrocytes numbered 3,220,000. The neurologic findings remained practically unchanged. Analysis of gastric content revealed some fresh blood which had not been present when the patient had been examined three years previously. Roentgenographic examination of the stomach revealed a small polyp on the posterior wall, near the greater curvature, which apparently had developed since the previous examination.

Following a week of preparation, operation was performed January 5, 1932. A carcinomatous polyp, approximately 3 cm. in diameter, was found in the middle third of the posterior gastric wall. The duodenum was mobile and well suited to a Billroth I type of resection, which was performed in the usual manner. The duodenum was united directly with the upper portion of the stomach. Pathologic examination revealed a polypoid adenocarcinoma, graded 1, without involvement of lymph nodes.

Convalescence was somewhat prolonged by the occurrence of a pulmonary infarct, but the patient was dismissed March 28, 1932, in good general condition; at that time the concentration of hemoglobin was 15.7 Gm.

When the patient was reëxamined April 18, 1933, there was considerable improvement in the neurologic condition. There were no gastric symptoms and the concentration of hemoglobin was 17.2 Gm. Roentgenographic examination of the stomach was negative, and the anastomosis was free. The patient's general health was good.

SUMMARY AND CONCLUSIONS

The necessity for careful roentgenographic examination of the stomach in all cases of primary anemia is emphasized. In a certain number of these cases, bleeding malignant polyps are found in the cardia. Careful surgical and medical coöperation is essential for the adequate care of these patients. Three cases are reported.

PEPTIC ULCERS INVOLVING THE GREATER CURVATURE OF THE STOMACH

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Peptic ulcers involving the greater curvature of the stomach outside the immediate vicinity of the pylorus are very uncommon. Because of this fact, and because such benign lesions are apt to be confused with carcinoma of the same location, a review of the literature concerning peptic ulcers of the greater curvature is presented with two case reports. A satisfactory review of this literature is impossible. Most of the reported cases have not been studied histologically; at least, if they were, no mention is made of the fact.

Before Finsterer and Glaessner[1] published an article on this subject in 1914, no one had considered the lesions important enough for detailed study. Many series of large numbers of gastric ulcers affecting all parts of the stomach had been reported; in such series a few greater curvature ulcers had been mentioned, but without further comment. A close inspection of these and more recent writings merely serves to confuse any accurate idea of the incidence of greater curvature ulcers. Lesions "near" the greater curvature, that is, lying on the anterior or posterior wall nearer the greater than the lesser curvature, are indiscriminately labelled "greater curvature ulcers." "Peptic affections," including erosions, cicatrices, as well as ulcers are often grouped together, especially in the German literature.

Two significant papers have appeared reviewing the literature on this subject. Finsterer and Glaessner[1] (1914) first called attention to the unusual nature of these ulcers. After an investigation of the writings on gastric ulcer prior to 1914, they were able to find only thirty-six instances of ulcer of the greater curvature, and only four of these could be designated with assurance as being exactly on the greater curvature and apart from the pylorus.

In 1928 David[2] reviewed the literature appearing after 1914, and found sixteen true peptic ulcers of the greater curvature. Ten of these were proved histologically. In none of the thirty-six cases cited by Finsterer and Glaessner[1] was histologic study mentioned. I have reviewed the cases reported by these authors, as well as all the available literature on this subject. As far as possible I have eliminated all those lesions definitely not peptic ulcers. The greater curvature ulcers are grouped in three divisions (Tables I, II, and III.).

Table I includes those cases[3-27] (139 greater curvature ulcers) found among large series, 4,603 ulcers altogether, of all parts of the stomach. No one can determine how reliable the reports in this group are. The papers of

Berthold,[4] Kirsch,[15] Kossinsky,[16] Nolte,[19] Scheuerman,[22] Schneider,[24] and Wolowelsky,[27] reporting forty-five greater curvature ulcers, were published before 1914; yet these reports are not cited and are apparently discredited by Finsterer and Glaessner.[1] David[2] mentions but discredits the twenty-four greater curvature ulcers apart from the pylorus reported by Sturtevant and Shapiro,[25] and Timbal,[26] and completely omits the articles by C. H. Mayo,[18] and Birgfeld,[3] who reported fourteen cases. In none of these 139 cases is it stated whether or not an histologic examination of the ulcers was made.

TABLE I

Ulcers of the Greater Curvature

Reported with Other Ulcers of Stomach [3,27]

Author	Year	Number Cases Gastric Ulcer	Greater Curvature Ulcers
Birgfeld	1925	223	5
Berthold	1883	373	8
Brinton	1865	220	5
Brunner	1903	380	7
Busch	1909	87	1
Citronblatt	1912	37	2
Federmann	1907	16	1
Finsterer	1910	18	2
Geilinger	1921	862	14
Gruber	1911	97	7
Gluzinski	1900	95	3
Jedlička	1924	300	3
Kirsch	1910	150	3
Kossinsky	1913	200	13
Kreuzer	1906	142	2
Mayo, C. H.	1921	638	9
Nolte	1883	42	1
Podlaha	1923	92	4
Riedel	1909	119	3
Scheuerman	1898	100	4
Schmitt	1910	44	2
Schneider	1906	98	3
Sturtevant and Shapiro	1926	120	14
Timbal	1920	26	10
Wolowelsky	1906	124	13
Totals		4,603	139

The second group of twenty-two cases, given in Table II,[1, 20, 28, 40] includes all greater curvature peptic ulcers which have been specially described. Ten of these were studied histologically. Three other cases, two by Blaine,[28] one by Secher,[36] were diagnosed only by *x*-ray, and were not operated on

or autopsied. In the remaining nine patients the tissues were studied grossly, but so far as the records indicate histologic examination was not done.

TABLE II

Ulcers of the Greater Curvature of the Stomach Specially Reported[1,20,28,40]

Author	Year	Number of Cases	Histology
Blaine	1925	3	Not given
Finsterer and Glaessner	1914	1	Peptic ulcer
Găldău	1930	2	Not given
Groedel and Levi	1912	1	Not given
Koch and Balaban	1928	1	Peptic ulcer
Medanic	1926	1	Not given
Lorenz	1924	2	Peptic ulcers
Podlaha	1923	1	Peptic ulcer
Raul	1927	1	Not given
Schlesinger	1917	1	Not given
Secher	1922	1	Not done
Simon	1927	1	Peptic ulcer
Sladký	1928	2	Not given
Sommer	1924	1	Peptic ulcer
Walter*	1923	1	Peptic ulcer
Author's cases		2	Peptic ulcers
Total		22	

Total number histologically proved, ten.

*This ulcer described by Walter was near a gastroenterostomy stoma.

Table III represents those lesions of the greater curvature reported as ulcer,[2, 37, 41, 45] but which are definitely not peptic ulcer as I understand the term.

TABLE III

Greater Curvature Lesions Not Peptic Ulcers

Reported under the Title "Ulcer of the Greater Curvature"[2,37,41,45]

Author	Year	Correct Diagnosis
Bauer, K. H.	1920	Tuberculous ulcer
Bauer, K. H.	1920	Fungus infection
David	1928	Chemical burn, due to drinking strong $ZnCl_2$ solution
David	1928	Aleucemic lymphadenosis
Kraft	1921	Carcinoma
Simon	1927	Carcinoma
Skvaril	1930	Carcinoma
Sproull	1931	Carcinoma
Stohr	1925	Chemical burn, due to drinking soldering solution (HCl and $ZnCl_2$)

The works of Berthold,[4] Kirsch,[15] Kossinsky,[16] Nolte,[19] Scheuerman,[22] Schneider,[24] and Wolowelsky[27] were inaugural dissertations, and were cited by G. Hauser.[46] Unfortunately, the original articles were not available. The one other article which I have cited but not read is that by Jedlička,[14] mentioned in the papers of David[2] and Simon.[37]

Not included in these lists are reports of many thousands of ulcers by numerous authors who did not find any of the greater curvature. Even röntgenologic evidence of these lesions is rare. Sproull[44] (1931) says:

> By personal communication with some of the leading röntgenologists whose combined experience covers several hundred thousand stomach examinations, not one has been found who has had the diagnosis of benign ulcer on the greater curvature confirmed

FIG. 1.—Preoperative röntgenogram of the stomach of the first patient. The lesion on the greater curvature is indicated by the arrow.

by histological examination. All other forms of stomach lesions are being diagnosed by these röntgenologists, and it seems reasonable to assume that, if this location of benign peptic ulcer ever exists, it would have been observed by some of them.

CASE I.—A.L. (A.M.B.H. No. 2713), a housewife, was born in Michigan of German parentage in 1871. She came to the University of Chicago Clinics Feb. 27, 1928, complaining that for about thirty-five or forty years she had suffered, once or twice annually, attacks of "stomach trouble." Analyzed, these consisted of epigastric, hungry, gnawing, sore sensations appearing two to five hours after eating and lasting until she relieved herself by eating again. Such attacks had commonly lasted several weeks, after which they spontaneously wore off. The disturbance had been continuous for two years, and had been for the previous two months so severe that the pain often doubled her up. Alkalies and infrequent vomitings gave temporary relief to her distress. There was no evidence that pyloric obstruction or that gastric hemorrhage had occurred.

She thinks that her trouble began shortly after a severe siege of typhoid fever at the age of eighteen years. In spite of her oft-repeated and long-continued illness she had maintained quite well her strength, weight, and appetite. She had, however, lost eight pounds during the year before admission.

Physical Examination.—The patient did not appear ill. Her cardiovascular system was normal; the pulse was 64, the blood pressure 134/94. In the abdomen no masses, no abnormal enlargement of liver or spleen, and no muscular rigidity were found. The epigastrium was slightly and diffusely tender to palpation. There were no other abnormal physical findings.

Laboratory Examination.—An Ewald meal gave the following results: amount, 95 cc.; free HCl, 0; total acid, 8. A trace of occult blood (Benzidine test) was found in the stools. The urine was normal, and the blood Wassermann reaction was negative. The blood count was normal.

X-ray Examination.—The stomach was atonic, low-lying, and the duodenal cap was normal. The pyloric antrum was, however, definitely contracted, and there was a

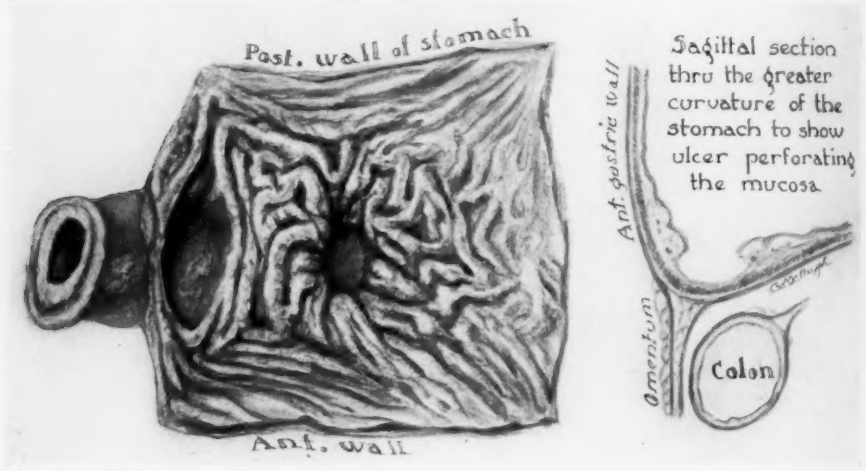
Post. wall of stomach
Sagittal section thru the greater curvature of the stomach to show ulcer perforating the mucosa
Ant. gastric wall
Omentum
Colon
Ant. wall

FIG. 2.—Drawing illustrating the lesion found on the greater curvature in Case I. The resected specimen has been partly opened along the lesser curvature to show the ulcer.

filling defect on the greater curvature at about its lowest portion, about five inches from the pylorus. No definite diagnosis could be made (Fig. 1).

Operation (Feb. 29, 1928).—A midline incision above the umbilicus exposed the stomach, revealing a tumor on the greater curvature one inch in diameter and about five inches from the pylorus. No other pathology was discovered. The lower three-fourths of the stomach was resected after freeing the greater and lesser curvatures. After closing the duodenum, a posterior Pólya anastomosis was made, and an enteroenterostomy made between the loops of jejunum used for the gastroenterostomy.

Pathologic Anatomy.—There was on the greater curvature 12 cm. from the pylorus a hard mass about 2 cm. in diameter. On the inner surface at this point was an ulcer in the mucosa, 1 cm. in diameter. Around this the rugae were edematous. The lesion was sharply delimited. Except for two superficial ulcers, each about 2 mm. in diameter, located on the lesser curvature, the remainder of the stomach, attached mesentery, and lymph nodes appeared normal (Fig. 2).

Microscopic examination showed no evidence of malignancy. Instead, there were the usual changes seen with a chronic peptic ulcer: the base of the lesion was formed of dense fibrous tissue infiltrated by a considerable number of plasma cells and lymphocytes, and occasional eosinophiles and polymorphonuclear neutrophiles. The surrounding

mucosa showed no especial changes other than a similar infiltration with inflammatory cells. Sections taken through various parts of the stomach elsewhere showed no change. The muscularis and serosa were intact (Fig. 3).

Post-operative Course.—The patient recovered from the operation uneventfully. She was followed for five and one-half years, and when seen Aug. 9, 1933, had been entirely free from her former complaints since the operation. A histamine test done at this time gave the following figures: free HCl, 15; total acidity, 41. A gastric fluoroscopy done at the same visit revealed a normally functioning anastomosis with no evidence of pathology.

CASE II.—I.T. (A.M.B.H. No. 67159), a Russian Jew born in 1875, entered the University of Chicago Clinics Sept. 6, 1932. For one year he had suffered severe epigastric pain. This appeared about two hours after eating, or just before mealtime; relief was always sought immediately and promptly obtained by eating, or by taking a

FIG. 3.—Photomicrograph of a section taken through the ulcer in the first case. (A) Floor of ulcer, formed of indurated granulation tissue. (B) Gastric muscularis (x 21).

teaspoonful of soda. There had been no vomiting, and he had not noticed tarry stools. During the year he had lost twenty-two pounds (from 179 to 155 pounds). In his past history there was nothing similar to his current trouble. His father and a brother had died of cancer.

Physical Examination.—The patient appeared to be in fair general health. His heart and blood vessels seemed normal, and his blood pressure was 115/82. The only significant finding was tenderness to deep pressure in the left upper quadrant of his abdomen.

Laboratory Examination.—The hemoglobin was 80 per cent., the red blood count 5,340,000, and the blood Wassermann and Kahn reactions were negative. A fractional gastric analysis, with 100 cc. 7 per cent. alcohol used as stimulant for secretion, yielded a free acidity of 52 clinical units. Stools showed a strong occult blood (Benzidine test) reaction.

X-ray Examination.—There was a "gross filling defect on the greater curvature of the stomach involving the pars media . . . Peristaltic waves did not pass through this area . . . In the center of the filling defect there appeared to be an exceedingly large crater which remained filled with barium . . . A large abdominal mass was palpated which corresponded to the gross filling defect of the pars media of the stomach, and directly over what appeared to be the large ulcer crater there was exquisite tenderness." Films confirmed the fluoroscopic picture (Fig. 4). The röntgenologic impression was

FIG. 4.—Röntgenogram illustrating the defect made by the ulcer on the greater curvature in the second case. Its unusual size and depth are well shown.

"very extensive annular carcinoma of the stomach, with a large ulcer crater. No obstruction has been caused by this tumor."

Operation (Sept. 14, 1932).—A midline upper abdominal incision was made with local anaesthesia. A large mass was found on the greater curvature of the stomach with thickened omentum and transverse colon adherent to it. The wall of the stomach about the mass was not indurated. The pyloric two-thirds of the stomach was removed, and a posterior Pólya gastroenterostomy made.

Pathologic Anatomy.—On the greater curvature about 14 cm. from the pylorus was a deep circular ulcer 1.5 cm. in diameter and 2 cm. deep. The margin of the ulcer was

smooth, the mucosa about it flattened out. The wall of the stomach was perforated and the floor of the ulcer was formed by thickened and inflamed gastrocolic omentum (Fig. 5).

Microscopic examination revealed no evidence of malignancy. The tissue near the ulcer and the gastric wall for some distance around it showed considerable inflammatory changes. The ulcer had completely penetrated all the layers of the stomach wall, its base being formed by dense granulation tissue infiltrated by large numbers of plasma cells, eosinophiles, round cells, and to a lesser degree by polymorphonuclear neutrophiles. The mucosa showed some inflammation and surface degeneration (Fig. 6).

Post-operative Course.—The patient recovered from the operation and when last

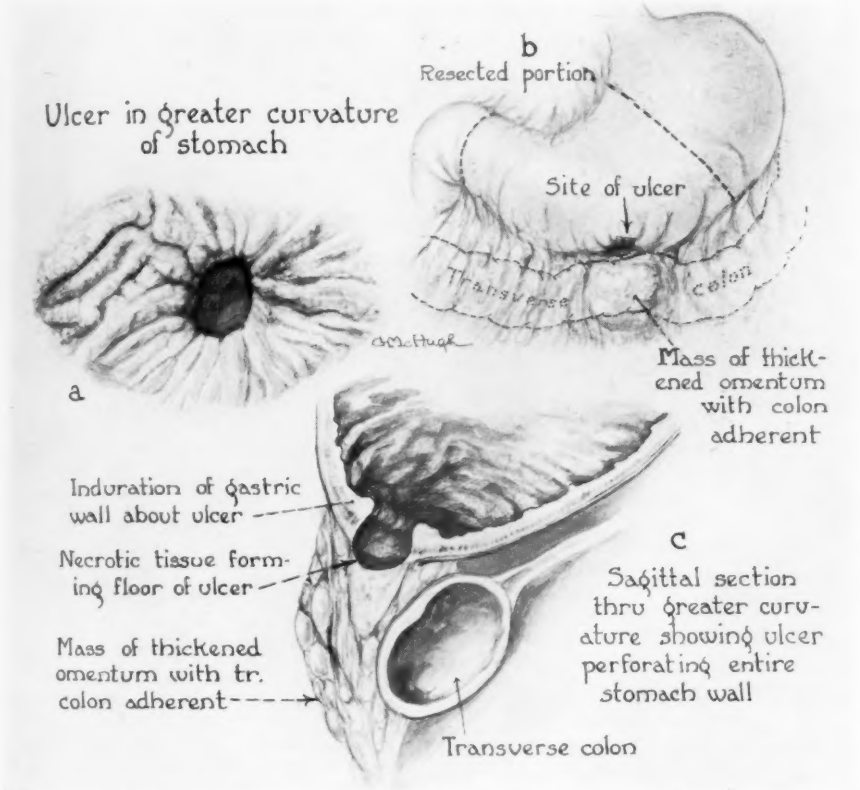
Ulcer in greater curvature of stomach
a
b
Resected portion
Site of ulcer
Transverse colon
Mass of thickened omentum with colon adherent
Induration of gastric wall about ulcer
Necrotic tissue forming floor of ulcer
Mass of thickened omentum with tr. colon adherent
c
Sagittal section thru greater curvature showing ulcer perforating entire stomach wall
Transverse colon

FIG. 5.—Drawing of the ulcer removed from the second patient. It has completely perforated the gastric wall, and has a base formed of greatly thickened and indurated omentum adherent to the transverse colon.

seen, fifteen months later (Dec. 28, 1933), was well and entirely free from gastric symptoms. Studies done at this visit showed: weight, 175 pounds; no free acidity in the gastric secretion after histamine injection; and no demonstrable defect, röntgenologically, of the remainder of the stomach.

PATHOLOGY.—No one can be sure just why peptic ulcers are located so frequently on the lesser curvature of the stomach and so seldom on the greater curvature. The various theories of mechanical irritation of the "magenstrasse," of poor blood supply to the lesser curvature with non-anastomosing arteries, *etc.*, are well known. The fact remains that greater curvature ulcer appears so rarely that one hesitates to diagnose it at all

except by histologic examination. K. H. Bauer[41] formulated his "localization-law" for peptic ulcers, stating that lesions located on the greater curvature must have some specific cause, such as carcinoma, the ingestion of corrosive chemicals which settle by gravity to the greater curvature, and so on. He insists that lesions of the greater curvature are not typical peptic ulcers. Although his "law" does not always hold true, it is nevertheless interesting that the nine lesions listed in Table III had a proved specific etiology.

Peptic ulcers of the greater curvature probably tend to perforate more frequently than do those of the lesser curvature. In so doing they often involve neighboring organs, such as the spleen (as in the cases of Finsterer

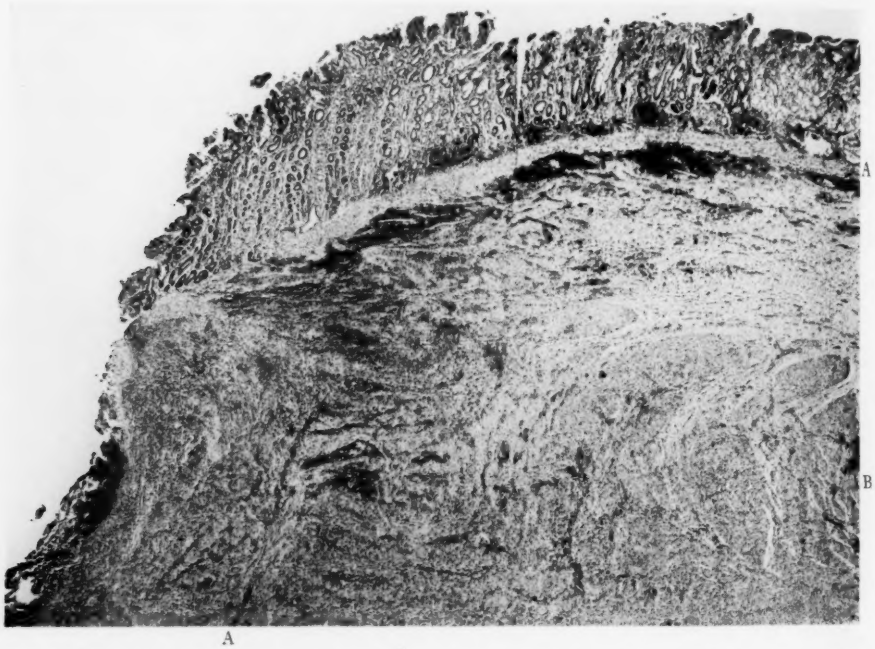

FIG. 6.—Photomicrograph taken through the wall of the second ulcer. The marked lymphocytic infiltration is quite evident (A). The muscularis is designated as (B) (x 17).

and Glaessner,[1] Podlaha,[20] Găldău,[29] Groedel and Levi,[30] and Medanic[32]), the anterior abdominal wall (as in one of Sladký's cases[38]), or the transverse colon. In the second case described in this paper perforation into the gastrocolic omentum resulted in the formation of an inflammatory mass. In none of the cases reported in the literature was evidence of organic obstruction mentioned.

Diagnosis and Treatment.—Ulcers of the greater curvature produce no characteristic symptoms distinguishing them from other peptic ulcers; there is no certain method of determining whether a lesion found on the greater curvature is benign or malignant, except by histologic examination. A review of the two cases described by the author illustrates how difficult it may be to differentiate this type of peptic ulcer from carcinoma. In the first

case a probable diagnosis of carcinoma was made before operation. In the second case every physician who saw the patient before operation felt that the disease was undoubtedly carcinoma. Only histologic studies sufficed to definitely diagnose both lesions.

The relative infrequency of ulcer on the greater curvature is responsible for the fact that lesions in that location showing a filling defect on röntgenologic examination are practically always regarded as carcinomatous. To mistake such a benign ulcer for carcinoma is not a mistake serious for the welfare of the patient since operation would usually follow and would be the best treatment for either lesion. However, to call a carcinoma in this location ulcer, and to treat it medically would be a serious mistake. Sproull[44] describes such an instance. He examined a woman, twenty-four years old, who had a röntgenologically demonstrable crater on the greater curvature of the stomach which was diagnosed a benign lesion. Operation was advised, and the patient refused to have one. Six months later another röntgenologic examination revealed a crater on the greater curvature no larger, and quite similar, to that first seen. She was not suffering, and medical management had apparently controlled her symptoms to a considerable extent. At this time she had an operation which revealed a small ulcer on the greater curvature. This appeared benign in every respect, so that a simple resection of the lesion was done. Even the pathologist felt that it was benign, after gross study; however, microscopic examination showed a carcinoma to be present. Eighteen months after the operation another röntgenologic examination and a reoperation revealed an extensive local recurrence with metastases. Kraft,[42] Simon,[37] and Skvaril[43] have similarly reported instances of carcinoma involving the greater curvature which were diagnosed before operation as peptic ulcers, the correct diagnosis being proved by operation and histologic study. These authors have shared with Sproull[44] the interesting experience of being unable to diagnose even grossly the resected lesion. A consideration of these facts has led all writers on this subject to insist upon immediate operation for lesions found on the greater curvature of the stomach.

SUMMARY.—(1) Two benign chronic ulcers of the greater curvature of the stomach are described. Both produced filling defects röntgenologically and were thought to be carcinomas before operation. In both instances histologic study established the diagnosis of benign peptic ulcer.

(2) Of greater curvature peptic ulcers reported in the literature only twenty-two cases were described in sufficient detail to warrant that diagnosis.

(3) Any lesion of the greater curvature of the stomach showing röntgenologically a filling defect is, *a priori*, probably not benign ulcer and should be treated surgically.

(4) A diagnosis of benign peptic ulcer of the greater curvature should be made only after histologic examination has confirmed the absence of carcinoma.

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MASSIVE HEMORRHAGE IN PEPTIC ULCER

REPORT OF 87 CASES

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When one refers to a bleeding ulcer it is well to have clarified what type of case is included in the discussion. In this report only those patients that have had one or more severe hemorrhages that have incapacitated them and necessitated hospitalization with the patient in shock, or with a secondary anemia, and blood transfusions have been indicated, are included.

The following cases have been studied with the hope of giving a more intelligent understanding of the treatment to be employed in severe gastric hemorrhage. After reviewing the eighty-seven cases it seemed advisable to divide them into five groups: (1) Hemorrhage occurring in patients with a peptic ulcer under competent medical management; (2) hemorrhage in cases operated upon for an acute perforation, or chronic ulcer, that had never hemorrhaged until months or years following the operation; (3) hemorrhage occurring in ulcers that had previously been operated upon for hemorrhage and the patient has continued to have recurring hemorrhages post-operatively; (4) severe hemorrhage that has occurred in patients with negative, or very short, gastric histories, and the patient never knew that he had an ulcer until the hemorrhage occurred; (5) patients admitted with hemorrhage and a long history of ulcer symptomatology but without regulated medical treatment.

In the gastro-enterological clinic of the Fourth Medical and Surgical Divisions of Bellevue Hospital, which is directed by Dr. Charles H. Nammack and Dr. Carl G. Burdick, there have been 671 ulcers treated between January 1, 1928, and January 1, 1934. In the clinic we have made every effort to relieve the patients of their symptoms, and give them every possible chance of a cure by medical treatment, and have referred patients for operation only as a last resort. During this period we have treated 507 unoperated peptic ulcers, and have followed 164 patients that were operated upon for either acute or chronic ulcers before entering the clinic. Of the number of post-operative cases seventy-eight had been operated upon for chronic ulcers, and eighty-six for acute perforation. During the past six years there have been forty-six patients referred for operation for relief of their symptoms. With the conservative treatment of ulcers there has been an increase in the incidence of gross hemorrhage during the past several years, and Table I gives the number of hemorrhages according to the year in which they occurred for the past twenty-two years. Although severe hemorrhage is a serious complication to treat it is not so commonly encountered as acute perforation in peptic ulcer, and when one compares the two complications by years it can be

seen that from January, 1911, to January, 1934, the incidence of perforation to hemorrhage was about two to one, as is illustrated in Table II.

TABLE I

Year in Which Hemorrhage Occurred

Year		Year	
1911	4	1923	1
1912	1	1924	3
1913	2	1925	2
1914	1	1926	2
1915	1	1927	3
1916	1	1928	10
1917	0	1929	13
1918	1	1930	11
1919	0	1931	11
1920	0	1932	8
1921	1	1933	4
1922	0		

In group one it is seen that we had sixteen patients with severe hemorrhage while in our clinic and under constant supervision. These cases include only unoperated cases that were being treated medically. The shortest period of treatment before the hemorrhage occurred was three months, and the longest period was three years. As there was 507 unoperated ulcers under treatment it makes the incidence 3 per cent. As I have stated we are including only severe gross hemorrhage and have excluded tarry stools from consideration. The treatment in this type of hemorrhage should be an operation after the patient's general condition warrants same, as any further attempt at conservative management seems futile because the hemorrhage has occurred after medical treatment was instituted. One can expect to find a rather large duodenal or pyloric ulcer which may be perforating into an adjacent viscus, and the pancreas is the organ most usually involved.

TABLE II

Showing Year of Perforation

Year	Died	Improved	Total	Year	Died	Improved	Total
1911	0	1	1	1923	3	6	9
1912	2	0	2	1924	1	7	8
1913	1	2	3	1925	0	8	8
1914	0	4	4	1926	3	5	8
1915	2	1	3	1927	0	9	9
1916	0	2	2	1928	0	9	9
1917	3	3	6	1929	1	12	13
1918	1	4	5	1930	2	9	11
1919	1	3	4	1931	5	14	19
1920	0	3	3	1932	6	6	12
1921	1	2	3	1933	1	3	4
1922	1	4	5				

In the second group we have encountered eleven cases and they present all types of operations. There are two pyloroplasties, one simple excision,

one excision with gastro-enterostomy, one partial gastrectomy, and six gastro-enterostomies. Three of these cases are reported:

CASE I.—Male, aged sixty-one years, admitted April 19, 1928, complaining of tarry stools and slight pain in abdomen for five days before admission, and vomiting of blood the morning of admission. *Past history.*—Patient was operated upon June 20, 1910, in the Carney Hospital, Boston, Mass., for a duodenal ulcer, with pyloric obstruction. He had been perfectly well following the operation until two weeks ago when he had slight abdominal pain. He was given a transfusion of 500 cc. of blood, by the direct method, and a Sippy diet. May 10, 1928, gastro-intestinal *x*-rays revealed the stoma normal but a duodenal deformity and he was discharged on May 17, symptom free. He was seen at intervals of four months for the following year and was last seen June 1, 1929, at which time he was symptom free. *Remarks.*—It is interesting to note that this patient went for a period of eighteen years, from the time of his original operation until the hemorrhage occurred.

CASE II.—Male, aged twenty-seven years, admitted February 27, 1929, complaining of stomach trouble for ten years and having vomited blood a few hours before admission. He had been operated upon twice before for ulcers, and the first operation was in November, 1924, when an exploratory laparotomy revealed the stomach normal and an appendectomy was done. In April, 1926, he was readmitted and operated upon for a duodenal ulcer and a gastro-enterostomy was performed. Since his second operation he has complained of having some epigastric pain but never vomited blood or passed tarry stools until the day of admission. He was given a transfusion of 350 cc. of blood by the direct method and left the hospital at own request two days later. He returned to the clinic and was *x*-rayed March 10, 1926, at which time a duodenal ulcer was reported, with the stoma normal. Patient failed to return for follow-up after June 15, 1928.

CASE III.—Male, aged forty-two years, admitted October 10, 1929, having passed tarry stools for three days and vomited blood for twenty-four hours before admission. *Past history.*—Patient was operated upon February 3, 1915, for a ruptured ulcer, at Post-Graduate Hospital. The report from that institution revealed a perforated gastric ulcer at the pylorus and an excision of ulcer was done, plus a gastro-enterostomy and appendectomy. He was discharged from the hospital March 14, 1915, following which he had slight abdominal discomfort at times but never pain or bleeding. After being admitted for the hemorrhage he was given one transfusion of 500 cc. of blood, and a Sippy diet. He made an uneventful recovery and was discharged October 31, 1929. Since his discharge he has not hemorrhaged and was last seen June 8, 1933, at which time he was having slight abdominal discomfort but no severe pain.

These cases have all been treated conservatively as the roentgen study of stomach and duodenum did not reveal a marginal ulcer in the group, and the only deformity was at the site of the original lesion. To reoperate with the hope of preventing further hemorrhage is optimism to say the least. From our experience in this type of case it is better to be conservative unless the patient has repeated hemorrhages, when one is then forced to reoperate, but so far this has not been the type that cause the chronic recurring hemorrhage.

The third group constitutes the most difficult type of case to treat, and we have had five cases in this group. Two cases will be reported briefly to show how difficult it is to offer a good prognosis in a hemorrhaging ulcer.

CASE I.—Male, aged fifty-seven years, admitted January 23, 1924, with a history of bleeding from rectum for ten days, and vomiting blood. He states that six years

previously he had a similar attack, another attack four years ago, but between the hemorrhages he has no abdominal pain or discomfort. During the first two attacks he was treated at home for several weeks. On January 25, 1924, he was transfused with 600 cc. of blood, by the direct method, and made an uninterrupted convalescence. A röntgen series on February 20, 1924, revealed a duodenal ulcer. He was discharged February 21, 1924, and re-admitted February 28, 1924, with a history of bleeding from the rectum for two days. An operation was performed March 6, 1924, and a gastro-enterostomy done for a duodenal ulcer. He was discharged March 24, 1924. He was re-admitted September 5, 1926, with a history of having been perfectly well until four days before admission when he passed tarry stools and vomited blood. He was transfused with 400 cc. of blood, by the direct method, September 7, 1926. X-rays taken September 20, 1926, revealed the stoma normal and the patient was discharged September 24, 1926, symptom free. Readmitted August 18, 1927, stating that he had been well since his last discharge until the day of admission when he passed tarry stools and vomited blood. Gastro-intestinal series, done September 30, revealed a normal gastro-enterostomy stoma, with a duodenal deformity. Patient was reoperated upon September 16, 1927, and an exploratory laparotomy revealed a normal gastro-enterostomy stoma with a duodenal ulcer but nothing further was done and the abdomen was then closed in anatomic layers. Since leaving the hospital this patient has been followed regularly in the clinic, reporting every three months for the past six years, and during this period he was well until September, 1933, when he was readmitted with a severe hemorrhage which necessitated two transfusions of 500 cc. each. X-rays taken January 4, 1929, revealed a normal stoma, otherwise negative. Again on May 5, 1930, *x*-rays were negative, and also on July 10, 1932, *x*-rays were negative. *Remarks.*—This patient has remained well for the past five years and after reviewing his history one can see that the last operation certainly did not play any part in his freedom from hemorrhage during this period of time, as nothing whatsoever was done except an exploration of abdomen.

Case II.—Male, aged thirty-one years, admitted December 1, 1929, in marked shock, and vomiting blood. *Past history.*—December 17, 1925, he was admitted with a history of passing dark stools and vomiting blood, and was transfused the same day with 700 cc. of blood, by the direct method. He was operated upon December 28, 1925, and a Finney pyloroplasty was done from which an uninterrupted convalescence was made. He was seen in the follow-up clinic on two occasions between January, 1926, and June, 1926, and on both visits he complained of some abdominal discomfort but no bleeding. Patient was reoperated upon January 8, 1928, at Post-Graduate Hospital and a partial gastrectomy was done for abdominal pain. He remained well following this operation until he was readmitted December 1, 1929, to Bellevue Hospital, in extreme shock, following a severe gastric hemorrhage. A transfusion was given December 4, 1929, of 500 cc. of blood, and again December 9 he was transfused with 500 cc. of blood. He was discharged from the hospital December 24, 1929, at which time he was symptom free. He was seen regularly in the clinic for the next two and a half years, and on all occasions he was symptom free and had no evidence of hemorrhage. X-ray examinations were done December, 1929, June, 1930, and April, 1932, which were negative for a marginal ulcer. He was last seen July, 1932, at which time he was symptom free. One can see in reviewing this case that in spite of a pyloroplasty and gastric resection this patient has had a very severe hemorrhage, and although this took place three years ago the patient has remained symptom free with conservative treatment.

From the few cases we have in this group very little can be offered the patient by re-operation. The first operation having been done to prevent hemorrhage and failed, then one should be even more guarded by a second surgical intervention.

The fourth group includes seventeen cases, and of these nine resulted in

death. It is the most interesting group we encounter because the pathologic process is apparently of short duration and the ulcer represents an acute necrotizing process which erodes through healthy vessels. The chronic ulcer patient produces some obliterative changes in the surrounding vessels and when a hemorrhage occurs it is very rarely fatal. As over 50 per cent of this group proved fatal one can see that a hemorrhage occurring in a patient with a negative gastric history presents a serious prognosis. The fatal cases have been reported[1] but three cases are cited to illustrate what a dramatic picture they present.

CASE I.—Female, aged fifty-one years, admitted March 23, 1927, died six hours later. The patient was admitted with a history of having vomited blood twelve hours before admission. Previous to that she had no symptoms referable to an ulcer. Infusions, morphine and supportive measures were administered but the patient continued to vomit blood. She was without funds and while arrangements were being made to have a transfusion, as a charity case, she had another profuse hemorrhage from which she died. Autopsy revealed an ulcer in the first portion of the duodenum just distal to the pylorus, with an open vessel in the base of the ulcer. *Remarks.*—This patient gave a negative ulcer history and the first symptom she had was a hemorrhage which took place twelve hours before admission, and in spite of supportive treatment after admission she died six hours later.

CASE II.—Male, aged forty-four years, admitted August 8, 1927, died August 10, 1927. Patient was admitted with a history of having vomited blood six hours before entering the hospital. Previous to that he had no symptoms referable to an ulcer. He was transfused the day of admission with 500 cc. of blood, after which he appeared in good general condition and stopped bleeding, but the next day, August 10, he had a rather severe hemorrhage from which he died three hours later. An autopsy revealed a gastric ulcer on the lesser curvature of the stomach in the region of pars media and pylorica, with a patent vessel in the base of the ulcer.

CASE III.—Male, aged forty-four years, admitted November 17, 1930, died November 20, 1930. On admission patient complained of vomiting blood and passing dark stools for twenty-four hours. Previous to that he had no symptoms referable to an ulcer. After admission to the hospital there was no evidence of hemorrhage. His general condition was good. Fluids were restricted by mouth; he was given morphine. His general condition continued satisfactory for the next three days but on November 20, at 3 A.M. he had a profuse hemorrhage and died twenty minutes later. Autopsy revealed an ulcer 1 cm. in diameter in the first portion of the duodenum on the posterior wall which was penetrating into the head of the pancreas. *Remarks.*—It is worth noting that this patient had a negative history until twenty-four hours before admission; after admission to the hospital his general condition was good, and there was no evidence of bleeding and no apparent need of a transfusion; but after being in the hospital for three days with rest, restricted fluids by mouth, and morphine, he had a profuse hemorrhage from which he immediately died.

In those cases that recovered conservative management has been employed, and so far we have had none of these readmitted for a second hemorrhage.

The fifth group constitutes by far the largest number of cases. It includes thirty-eight, or 43 per cent of those reported. It is interesting to study the increase in bleeding cases during the past six years and try to explain why such an increase should take place with the improved efforts at education and treatment of patients with peptic ulcers. One can see that the un-

treated peptic ulcer runs a much greater chance of bleeding than does the patient under medical care. The treatment for this group has been both conservative and operative. There have been seventeen patients operated upon with four deaths. The type of operation has varied: three partial gastrectomies, two pyloroplasties, one local excision, three excisions plus gastro-enterostomy, and eight gastro-enterostomies. Of the cases that died it included one partial gastrectomy, and three gastro-enterostomies. There were twenty-one patients receiving conservative treatment, which is over half the number in the group. It is this type of case that causes the most difficulty among physicians, as to the proper method of treatment. The reason is that patients have had ulcer symptoms for years and the hemorrhage is considered by the surgeon as a true indication for operation. That should not be the case because one hemorrhage is not a real indication for operating on a patient with an ulcer. Of the twenty-one patients treated conservatively, eleven have been followed in the clinic and none have had a second hemorrhage, although some have been followed for five years and the shortest any patient has been under observation is four months. From the study of this group it would seem that the conservative management is by far the best method of treatment and an operation is never indicated except in repeated hemorrhages.

Comment.—In outlining the management of a severe hemorrhage it is most important to consider the history and clinical course of the patient. Obviously, in the first group of cases, surgical intervention is desirable after the patient has recovered from the acute hemorrhage and is properly prepared for operation. A fatality in this type of patient is unusual, but the disability from recurring hemorrhages constitutes a most discouraging problem from the patient's point of view. In the second group we have a more difficult condition to treat, as the patient has either had some form of excision, gastro-enterostomy or gastric resection; and unless these patients have had two or more hemorrhages a reoperation should not be considered as the hemorrhage has occurred in spite of previous surgery, and possibly as a result of the surgery; therefore, one cannot give the patient much assurance that the same thing may not recur. In the third group we have the most difficult type of patient to treat with which one is confronted. Some of these patients have had several operations, including resection, and in spite of multiple operations have continued to bleed, and for that reason one should hesitate before reoperating upon these patients in the hope of relieving a hemorrhage, unless a definite marginal ulcer can be demonstrated, which is usually not done. In group four it can be seen the patient may have a severe hemorrhage and die suddenly, although one should not infer that because a patient with a negative, or short gastric history before the hemorrhage occurs, will have a fatality as a result of it. This is the type of patient one is undecided whether it is best, after giving repeated transfusions, and the patient's condition is considerably improved, to operate or treat conservatively. When one operates early in this type of case the ulcer must be ex-

cised, even if a gastric resection has to be done; otherwise surgical intervention is of no avail.

In the fifth group we encounter more misunderstanding than in any other because the surgeon usually thinks that the long history, plus a hemorrhage, warrants surgery, but such is not the case. These patients have not received any regulated medical care and it is unusual for them to be admitted for a second hemorrhage. The results from conservative treatment have been sufficiently encouraging not to recommend operation in the first hemorrhage.

REFERENCE

[1] Hinton, J. William: Fatal Hemorrhage in Peptic Ulcer Treated Conservatively. (Report of Nine Cases.) (To be published.)

CARCINOMAS OF THE LARGE BOWEL

PART I

THE COLON

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It would be extremely difficult to add to the operative technic for neoplasms of the large bowel since there is, perhaps, no region in the body where methods have been more carefully devised for the removal of malignant growths. Nor have cancers elsewhere been more carefully studied from the standpoint of treatment and result. Due largely to their inaccessibility, malignant tumors of the colon and rectum comprise a group in which early diagnosis is difficult and treatment frequently unsuccessful.

The mortality from this disease entity has not decreased in proportion to the advance in general cancer surgery. This is not due entirely to the inadequacy of surgical methods, for in selected cases favorable results have been obtained in a relatively high percentage. Treatment connot, however, be limited to selected cases. An appalling number are so far advanced when seen by the surgeon that cure is doubtful, if not impossible. Successful treatment is resolved into two integral parts, early diagnosis and complete extirpation. The coöperation of the internist, family physician and the patient himself is an obvious prerequisite to successful surgical treatment.

This paper summarizes the data obtained from a large number of case studies and attempts to evaluate the diagnostic findings and the correlation of treatment with result as shown by the statistics of the group.

Every case of cancer of the colon and rectum admitted to the Johns Hopkins Hospital since its wards were opened in 1889 has been analyzed. During this period of forty-two years, 511 cases of such carcinoma have been observed. One hundred ninety-two of these were located in the colon and 319 in the rectum. This number includes all cases regardless of treatment administered. The diagnosis of a certain number in which no pathological material was obtained must necessarily remain in doubt but the ultimate outcome of the great majority leaves no question as to their diagnosis.

The disposition of the 190 carcinomas of the colon is illustrated in Table I. For this purpose the colon is arbitrarily divided into five portions. These divisions, while not agreeing with those of some authors, are so designated by the differential characteristics of the tumors from the standpoint of clinical features and operative treatment.

TABLE I

Distribution of 192 Carcinomas of the Colon

Location	Number of Cases	Percentage
Cæcum and ascending colon	67	35.3
Hepatic flexure	18	9.5
Transverse colon	14	7.4
Splenic flexure	11	5.7
Descending colon and sigmoid	72	37.4
Location undetermined	10	4.7
Total	192	100.0

The relative distribution of the carcinomas in both colon and rectum is shown more graphically in the diagram of Fig. 1.

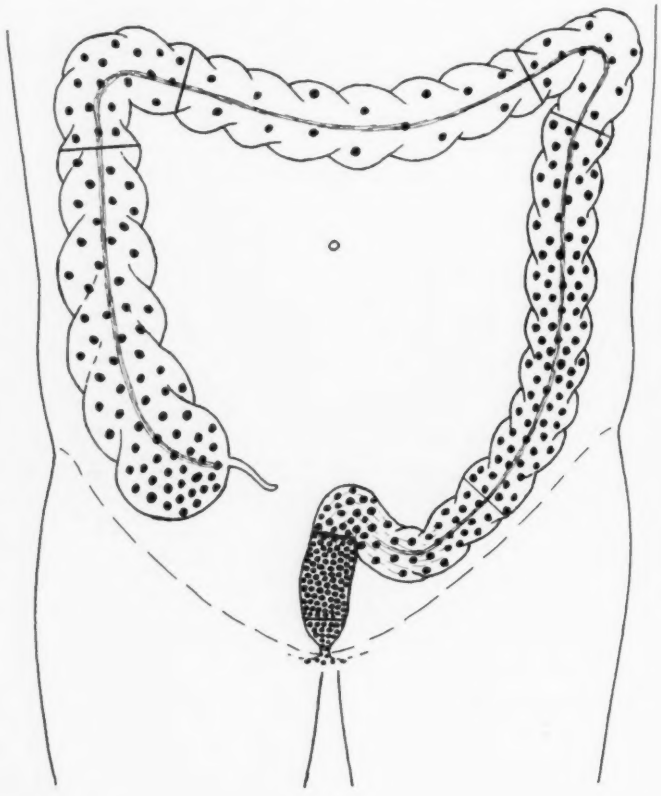


FIG. 1.

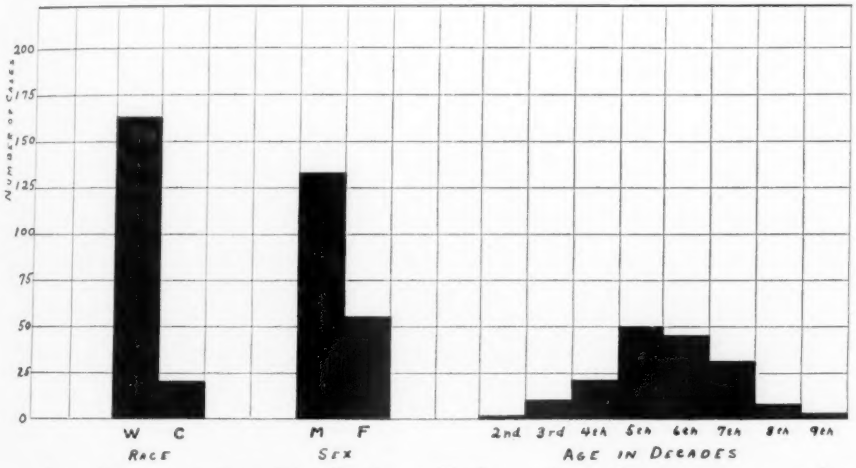
It is obvious that no hard-and-fast line can be drawn between the various divisions, but a word of explanation will perhaps clarify the border-lines as stated. The *cæcum and ascending colon* includes the bowel between the ileo-cæcal valve and a point just proximal to the flexure. The *hepatic flexure* designates the region as its name implies for a distance of perhaps 6 to 8 cm. on either side of the angle of the gut. The transverse portion up to a

similar point proximal to the splenic flexure is the *transverse colon.* The region about the *splenic flexure* is limited similarly to the hepatic flexure. The *descending colon,* including the sigmoid colon, extends downward to the junction of the colon and rectum.

A glance at Table I shows the distribution and points of greatest cancer frequency. The descending and sigmoid colon together contain the greatest number of growths, the cæcum almost as many, while the transverse colon and flexures contain a surprisingly small percentage of the total number. The reason for this peculiar distribution is vague and as yet is impossible to explain conclusively. It has been suggested that throughout the intestinal tract the greatest cancer frequency occurs at those points where fæcal stasis is most marked, but the inter-relationship of these factors of stasis, irritation and tumor formation has not been accurately established.

TABLE II

Age, Race, Sex Distribution of Carcinomas of the Colon



Age, Race and Sex Distribution.—Perhaps these factors are too often overemphasized since their consideration can offer little in the way of clinical diagnosis and treatment. Nevertheless, the following table is inserted for the convenience of those interested in this phase of the subject.

This table combines the three factors of age, race and sex. In the first column are shown the proportionate numbers of tumors occurring in the white and colored races respectively. The whites outnumbered the blacks about eight to one. Too much significance cannot be attached to this fact, however, when it is recalled that members of the white race come under hospital observation far more frequently than do Negroes. Males outnumbered females a little over two to one, a discrepancy which is difficult to understand but which, nevertheless, has been noted in other groups of gastrointestinal cancer. The age distribution shows, as might be expected, a predominance in the so-called "cancer age" between forty and seventy. No cases were found in the first decade and only two in the second.

Gross Pathology.—Certain definite gross forms assumed by carcinomas in the large bowel bear a direct influence upon the symptomatology. The most common of these is the "crater-form ulcer" which shows a persistent tendency to encircle the lumen. This type usually begins as a tufted elevation of mucosa on one side of the lumen and increases in size while at the same time the edges pile up, overhanging an excavated ulceration. Growth proceeds more rapidly in a circular than a longitudinal direction and the common finding observed in advanced cases is an annular ulcerated collar surrounding and constricting the lumen. In some instances the growth is more rapid on one side of the lumen, usually at the mesenteric border, and instead of forming a symmetrical ring, the growth is projected eccentrically out into the wall, producing an irregular mass on the external surface. This type of growth rarely causes early obstruction and consequently reaches a large size before it is recognized. Central necrosis is not an uncommon feature and occasionally a fistulous communication between such a cavity and the bowel lumen may be formed.

Another common type is the friable, cauliflower growth, rarely encircling the lumen but producing partial or complete obstruction by encroaching upon the lumen. It is irregular, fungating and soft. Such a gross form is apt to be associated with the extremely cellular carcinomas sometimes called medullary. Cystic gelatinous areas are not infrequently found and when present indicate a tumor of the colloid type.

The small polypoid or pedunculated growths are usually indicative of low-grade adeno-carcinoma. They begin as small tufted elevations of musoca which are caught and elongated by the traction of passing fæcal contents until left attached to the wall by small pedicles. These tumors likewise never encircle the lumen but may produce symptoms of obstruction by encroachment or more rarely by intussusception.

Less common is the small constricting "napkin ring" tumor usually assumed by the so-called scirrhous carcinomas. These rarely ulcerate but infiltrate the bowel wall, stimulating a fibrous reaction and producing a small constricting ring. They frequently contract until the outside diameter is less than that of the normal bowel.

It should be emphasized that many variations of these gross forms can occur. Carcinomas may assume bizarre shapes and not infrequently demonstrate a combination of forms.

Carcinomas show a predilection for invasion of surrounding tissues and operative removal is frequently hampered by such extension. Tumors of the transverse colon show a surprising tendency toward invasion of the stomach. This had occurred in fully half of the cases in this series, thereby converting the removal from a comparatively simple resection to an extremely hazardous and extended operation. Growths elsewhere may attach themselves to the abdominal wall, to loops of intestine or to any other nearby structure. When located low in the pelvis the bladder is a frequent site of extension.

Microscopical Pathology.—The histology exhibited by tumors of the colon and rectum is discussed under a few simple groups although it is hazardous in view of the variance of types to attempt a hard-and-fast classification. 96.4 per cent. were variations of the so-called adeno-carcinomas with a majority of the pure glandular type. These are made up of atypical proliferations of epithelial cells extending beyond the normal limits of the mucosa and invading the other layers of the intestinal wall. These cells retain in general the glandular form but are influenced somewhat by the degree of malignancy. The lower grades form typical glands in all parts of the tumor while the more malignant cells frequently arrange themselves in tortuous irregular strands or in non-cohesive groups of individual cells. 30.9 per cent. showed the presence of mucoid degeneration. This is believed not to comprise a separate pathological entity but to represent a secondary change in a preëxisting adeno-carcinoma.[1]

Another form commonly described is the so-called scirrhous carcinoma which is thought also to represent a variant form of adeno-carcinoma in which connective tissue has hypertrophied to the extent that cellular hyperplasia is retarded. Hence these are regarded as less malignant than the previous types. They grow slowly, produce symptoms early and metastasize late, and are therefore more amenable to surgical treatment.

"Medullary carcinoma" is a term which has been used more or less loosely to describe carcinomas in which the glandular reproduction is absent and the fibrous reaction is minimal. The cells are packed densely together, form a soft spongy structure, and in some cases resemble large round-cell sarcomas. They grow rapidly, metastasize early and are difficult to remove completely.

Primary mucoid carcinomas are rare. They likewise originate from the epithelium of the mucosa but seldom show glandular reproduction. Hypersecretion of mucus is evident and the cells are so distended as to form the signet-ring cells commonly referred to in colloid carcinomos and Krukenberg's tumor. Extravasation of mucus forms large areas or cystic deposits in which the cells float free. These resemble the accumulations typical of adeno-carcinoma with mucoid degeneration but differ in the absence of epithelial lining and the presence of signet-ring cells. Rarely have the two types been observed in the same tumor and it is the author's impression that these represent different phases of cellular hyperplasia. These tumors are very malignant due largely to their invasive power and the difficulty encountered in removing the gelatinous grapelike clusters of mucoid material without leaving implantation metastases.

While their status is as yet somewhat in doubt carcinoid or argentaffine tumors should be mentioned as a type of carcinoma since two of this type were found in the colon. These tumors are characterized by solid nests and strands of tumor-cells arising from the chromo-argentaffine cells of the

[1] Raiford, T. S.: Mucoid Carcinoma of the Gastro-intestinal Tract. Surg., Gynec., and Obst., vol. 55, p. 409, October, 1932.

epithelium. They possess an affinity for silver salts and when stained by the silver impregnation method appear as dark brown or black granulated cells. Commonly regarded as benign, they may assume malignant characteristics, metastasizing in the same manner as carcinoma and, if not removed, resulting in a fatal termination. Both of the cases in this series were of this nature.

Squamous-cell carcinomas comprise a small group common to the lower rectum and anus. Tumors with similar microscopical characteristics are occasionally found as high as the sigmoid colon but when found in this location undoubtedly represent a metaplastic process.

Table III gives the percentages of the various histological groups.

TABLE III

Histological Distribution

(Carcinomas of the Colon)

Histological Type	Number of Cases	Percentage
Adeno-carcinomas, total	40	41.2
Grade I	2	
Grade II	14	
Grade III	17	
Grade IV	7	
Scirrhous carcinoma or carcinoma with fibrosis	14	14.4
Cellular or medullary carcinoma	3	3.1
Adeno-carcinoma with mucoid degeneration	37	38.2
Squamous cell carcinoma	1	1.0
Carcinoid tumors	2	2.1
Total*	97	100.0

Malignancy.—The malignancy of carcinomas depends largely upon the histological types. Criteria by which it is judged are the rapidity of growth, the presence or absence of metastases and the recurrence after removal. On the basis of these factors it was found that the cellular or medullary and the primary mucoid carcinomas gave the poorest prognosis. The adeno-carcinomas varied greatly in their manifestations of malignancy. Gradation has been attempted by many pathologists, some on the basis of manner of growth, metastasis, extension, etc., others on the histological form alone. To be of value, gradation must embody a combination of these features and the results of the cases in this series have borne out the division of grades on such a basis. The presence of mucoid degeneration is a preëxisting adeno-carcinoma does not necessarily alter the grade. On the contrary, the amount of mucus present apparently is dependent upon the grade. The adeno-carcinomas with marked fibrosis and restriction of cellular hyperplasia have proved to be most amenable to surgical treatment.

Metastasis depends upon the inherent regenerative ability of the malignant cell, and, as may be expected, occurs earliest from the cells approaching most nearly those of early phylogenetic development. The regional

* Those cases in which histologic examination was possible.

TABLE IV

Prognosis Compared with Histological Type

(Including all Carcinomas of the Colon and Rectum)

Histological Type	Per Cent. Presumably Well*
Cellular or medullary carcinoma	0.0
Primary mucoid carcinoma	0.0
Adeno-carcinoma	
Grade IV	20.0
Grade III	22.2
Grade II	24.0
Grade I	43.0
Adeno-carcinoma with mucoid degeneration	34.8
Scirrhous carcinoma or carcinoma with fibrosis	50.0

lymph-glands are usually the first sites of secondary growths. Metastases from cæcal tumors to the liver were comparatively rare in this series while from the transverse and descending colons the opposite was true. Omental deposits were not uncommon from the same regions and the pancreas was occasionally found to be the site of metastases. Although involvement of the skeletal system was rare it is frequently described and when present shows a predilection for the skull, ribs and vertebræ. Secondary tumors were found in other parts of the bowel in a few cases. Some of these, however, might well represent a part of a multiple process or a secondary tumor by invasion. The appended table illustrates the distribution of metastases from the colon.

TABLE V

Location of Metastases

(Carcinomas of the Colon)

Location	Number of Cases	Percentage
Lymph-glands	47	24.8
Liver	17	8.9
Other locations	19	10.0

Clinical Features.—The clinical manifestations of carcinomas of the colon are perhaps so well known that to recount them in detail is unnecessary. The more important of these as applied to tumors in general will be reviewed briefly. The more specific features affected by the location will be taken up under the various divisions.

As Rankin has pointed out, general symptoms depend largely upon the gross form of the tumor and the presence or absence of such complicating factors as ulceration, hæmorrhage, perforation, etc. For example, stenosing growths present a different clinical picture from those which do not impede the passage of fæcal contents. Large ulcerating growths may by gross hæmorrhage produce a profound anæmia while small constricting tumors cause little appreciable change in the blood-picture.

For the purpose of simplicity the symptoms are divided into the indefi-

*Wherever the term "presumably well" appears in the following text it designates the cases living without evidence of recurrence, irrespective of the length of time.

nite manifestations of the early stage and the late symptoms of advanced cancer.

Slow-growing cancers are insidious in onset. The patient may suffer vague gastro-intestinal disorders, so slight that he is unaware of the actual beginning. While retaining his normal appetite, food produces a sensation of epigastric unrest accompanied by eructation, occasional regurgitation and moderate distention.

There is no universal rule for bowel habit in any stage of carcinoma. Constipation, so frequent in people of all ages, is common but of questionable significance. Diarrhœa, likewise frequent in many gastro-intestinal disorders, is never specific for cancer. Nevertheless, it should be emphasized that either of these conditions occurring suddenly and persistently in people above the age of forty whose bowels have previously functioned normally warrants investigation and should be considered suspicious of cancer until proved otherwise. More rarely constipation alternating with diarrhœa is regarded with some importance, especially when the latter consists largely of mucus with a characteristically foul and pungent odor.

Pain is seldom a striking feature of early carcinoma. When present it is generalized and mild, usually following the ingestion of food and relieved as digestion proceeds. Malaise and cachexia appear insidiously. Weakness, fatigue and dyspnœa gradually incapacitate the patient. Loss of weight begins slowly and progresses steadily.

Such are found to be the indefinite symptoms of the premonitory stage and not infrequently are these the sole evidence of malignancy. Diagnosis is difficult in the unfortunate few who come to operation after the disease has progressed to an inoperable stage. Thorough gastro-intestinal examination in cases of this type would no doubt enhance early diagnosis but all too frequently are the early symptoms insufficient to arouse suspicion or justify the complete examination.

Diagnosis is facilitated by the striking manifestations of late gastro-intestinal cancer. Blood in the stools, appearing subsequent to ulceration, is perhaps one of the most alarming symptoms. Black or tarry stools as a rule follow bleeding from the proximal colon. If the lesion is located in the descending colon, the blood may appear in clots and be brighter in color.

Severe attacks of indigestion accompanied by eructation, regurgitation, nausea or vomiting are common. It is striking that in many instances the symptoms are those of gastric disturbance and when diagnosed clinically the lesion is not infrequently localized in the stomach. Regurgitation of flat-tasting, acid-free fluid is explained by the frequency of gastric achlorhydria in association with carcinomas of the large bowel.

Disturbance of bowel habit is common and severe. This is mostly described as constipation, but when further questioned, the patient admits the ability to pass only small amounts of fæces mixed with bloody mucus. Hence catharsis frequently fails to relieve the condition and results in a more intense and unsatisfied desire to defecate. The diarrhœa which occurs in ap-

proximately one-fourth of the cases is not characterized by the customary fluid stools. It consists of mucus and blood mixed with fæces in a flocculent manner which has been aptly designated "cancer diarrhœa." The alternating constipation and diarrhœa can therefore be explained on the basis of retarded evacuation of bloody, mucoid stools.

The vague distention frequently noted in the premonitory stages is increased late in the disease by partial obstruction. Incited by the combined blockage of intestinal contents and impaired functional activity, it rarely becomes marked until obstruction occurs.

Pain is more constant, is dull and aching in character and localized to the region of the growth. Acute obstruction produces the pain characteristic of that condition. Cachexia advances rapidly and loss of weight is marked. Weakness and extreme lassitude are common. Secondary anæmia, sometimes to a profound degree, is to be expected. Anorexia may cause the patient to be nauseated by the sight of food. Vomiting in a few instances is so severe as to cause the patient to become dehydrated.

A tumor may be palpated in many instances but at times is recognized only by a moderate degree of muscle spasm and an indefinite sense of resistance over the region. If the growth is rapid and extensive, metastatic nodules may be felt in the liver. Tenderness is not constant.

Secondary effects of the tumor may present numerous complicating symptoms. Encroachment upon the nerves of the lumbosacral plexus has produced neurological disorders. Acute gallbladder disease is sometimes simulated by growths in the hepatic flexure or transverse colon while extension to the stomach not infrequently refers symptoms to that organ.

Diagnosis.—Although symptoms and signs are in some instances fairly conclusive, the most efficient means of diagnosis is the barium enema, surpassing the barium meal by filling more completely and homogeneously the terminal bowel. A constricting filling defect is the most common finding and indicates a tumor of the annular type. Asymmetrical indentations are produced by polyps, sessile tumors or extraluminar masses. Tumors of the stomach and small intestine have been known to cause filling defects by pressure in the colon. Hence it is never amiss to perform a gastro-intestinal series to rule out upper bowel pathology as embarrassing mistakes have been known to occur following the omission of this procedure.

Carcinomas of the large bowel are to be distinguished from other abdominal neoplasms, benign tumors, and other unrelated conditions. Intra-abdominal neoplasms arising in other locations usually produce symptoms related to the systems of which they are a part. Hence, thorough examination of all systems is sometimes necessary for the distinction. Benign tumors, tuberculosis, non-specific granulomas and cysts may attain a size sufficient to confuse the diagnosis. As a rule, the general symptoms are of less severity but accurate diagnosis is seldom made before a pathological specimen is obtained. Sarcomas and other malignant tumors of the bowel are rarely distinguished without the aid of the microscope.

Colitis may produce blood and mucus in the stool but obstructive symptoms are lacking and the X-rays show no constant filling defect.

Such are the general characteristics of carcinoma of the colon. The more specific details relevant to the separate divisions as brought out by this study will be discussed under the heading of each portion.

CÆCUM AND ASCENDING COLON

Tumors in this portion of the bowel rarely encircled the lumen. Slowly advancing obstruction was produced in the majority of the cases by the encroachment of an irregular fungating mass arising from the intestinal wall on one side. Ulceration was present in a small per cent. of the cases.

Histologically, the majority of the tumors were adeno-carcinomas, a large proportion showing secondary mucoid degeneration. Those in which pathological specimens were obtained were distributed among the histological types as follows:

Histological Distribution

Histological Type	Number of Cases	Percentage
Adeno-carcinomas, all grades	17	42.5
Adeno-carcinomas with mucoid degeneration	16	40.0
Primary mucoid carcinomas	2	5.0
Scirrhous carcinoma or carcinoma with fibrosis	2	5.0
Medullary or cellular carcinoma	1	2.5
Carcinoid tumors	2	5.0
Total	40	100.0

Metastases.—The lymphatic supply to the right colon is not abundant since this portion of the bowel is primarily concerned with the absorption of fluid rather than nutritional substances. Most of the secondary growths were produced by local extension or metastasis to regional nodes. In only one case had the liver been involved. Eight had invaded nearby structures. The location of metastases was as follows:

Location of Metastases

Location	Number of Cases	Percentage
Lymph nodes	27	40.4
Liver	1	1.5
Other locations	8	11.9

Clinical Aspects.—Neoplasms in this portion of the bowel were characterized by the absence of definite symptoms. Not infrequently was the only symptom a marked secondary anæmia. So universally is this true of cæcal cancer that some surgeons regard any severe unexplained anæmia with suspicion or even go so far as to say that the diagnosis of pernicious anæmia should never be made without first X-raying the proximal colon. While this statement may be exaggerated, it is true that right colonic cancer produces an anæmia which is relatively greater than that of the left colon and rectum.

This fact is illustrated in Table VI by the comparison of the hæmoglobin values in different parts of the bowel.

TABLE VI

Average Hæmoglobin Values

(109 Carcinomas of the Colon)

Location	Percentage Hæmoglobin	Number of Cases
Cæcum and ascending colon	64.8	36
Transverse colon and flexures	71.4	27
Descending colon and sigmoid	75.5	46
Total number of cases		109

While these figures do not coincide exactly with those of Koons at The Mayo Clinic, the tendency toward increasing anæmia at the proximal end of the colon is clearly illustrated. No satisfactory explanation for this has been offered. If, as has been suggested, the anæmia is due in part to a toxic process, the greater diameter of the cæcum and ascending colon may contribute to this result by allowing the growths to attain a larger size before clinical recognition. Obviously bleeding which is seldom perceptible in the gross cannot account in full for the low value of the hæmoglobin.

Pain, when present, was generalized, dull and aching, occasionally leading to the erroneous diagnosis of appendicitis. Advanced cachexia may not be present until late. Marked anorexia and loss of weight are thought by many to indicate an extensive growth with metastases. Obstruction with its attendant symptom complex was present in a small proportion of the cases. Tumors in this region did not show the striking tendency to encircle the lumen exhibited in other locations. This with the larger diameter and the more fluid contents was no doubt responsible for the infrequency with which blockage occurred. Ileocæcal intussusception with its typical symptoms was produced in two cases.

Diagnosis was usually made by palpation of the mass and confirmed by the X-ray findings. The latter cannot be considered infallible in diagnosing small early lesions but as a rule were sufficiently constant to permit the diagnosis of many neoplasms whose only symptoms were anæmia and cachexia. The defect in most instances was irregular and confined to one wall of the bowel.

Treatment.—Fortunately, the operative technic for malignant growths in the right colon is well standardized, and, in spite of late diagnosis, surgery offers an excellent chance for cure. Simple resection with a good margin of normal bowel followed by an end-to-end, lateral or end-to-side anastomosis is the easiest procedure, but has the disadvantages of occasional incomplete removal and necessitating an anastomosis in thin-walled gut where the blood supply is not abundant. Resection of the entire right colon, while a more extensive procedure, overcomes these faults. Division of the ileum 20 to 30 cm. above the ileocæcal valve with wide dissection of the ascending and

proximal transverse colon has been found most practicable. Some operators advocate an ileostomy some distance above the anastomosis which is no doubt extremely beneficial in avoiding undue tension on the suture line. Lahey has recently devised a two-stage operation patterned after the procedure of Mikulicz. It, like other two-stage operations, has the advantage of reducing the operative shock of each stage but prolongs the operative period over several days.

The efficacy of right colectomy can well be appreciated when it is noted that of the eleven cases in which this operation was employed only two died, an operative mortality of 18 per cent., while the mortality following other procedures of all types was 32 per cent.

Prognosis.—In spite of delayed diagnosis, 52 per cent. of the cases in this location were operable. Fifteen, or 40 per cent., of the thirty-eight cases surviving operation are presumably well. Three factors were found which may in part account for this favorable prognosis; the infrequency of distant metastases enhanced the removal of all diseased tissue. The rate of growth was slow. Finally, histological examination revealed that a high precentage of these tumors were of low-grade malignancy.

Below is a table summarizing the methods of treatment as compared with the ultimate results.

TABLE VII

Carcinoma of the Cæcum and Ascending Colon

Results of Treatment

Operation	Dead Following Operation	Dead from Late Effects of Tumor	Presumably Well *	Unknown	Total
Palliative operations, inoperable....	8	16	1†	7	32
Resection with lateral anastomosis .	4	1	9	5	19
Resection with end-to-end anastomosis.....	2	4	2	0	8
Resection right half of colon.....	2	2	3	1	8
Total.....	16	23	15	13	67

* Includes all cases living without evidence of recurrence.

† This case was treated by radium and deep X-ray and is living at present two years after operation.

HEPATIC FLEXURE

These few tumors resembled histologically those of the cæcum. As flat or fungating, sometimes ulcerated growths, they did not tend to encircle the bowel early but formed indurating, eccentric or extra-luminar masses. The histological distribution was as follows, no one type being in predominance:

Metastases.—To the more abundant lymphatic supply of the hepatic flexure has been ascribed the reason for earlier and more extensive metastases of carcinomas in that region. From the eighteen tumors in this group metastases were found in the following locations:

Histological Distribution

Histological Type	Number of Cases	Percentage
Adeno-carcinoma, all grades	2	22.2
Adeno-carcinoma with mucoid degeneration	3	33.3
Scirrhous carcinoma or carcinoma with fibrosis	3	33.3
Medullary or cellular carcinoma	1	11.2
Total	9	100.0

Location of Metastases

Location	Number of Cases	Percentage
Lymph nodes	8	44.4
Liver	1	5.5
Other locations	3	16.6

Clinical Aspects.—The predominant symptoms of this group were similar to those produced by neoplasms arising in the cæcum and ascending colon. Anæmia was just as pronounced but definite signs were often lacking until the growth had reached an advanced stage. Obstruction was slightly more frequent but this was incurred partly by the angulation of the bowel. In view of their proximity to the gallbladder, chronic cholecystitis was frequently simulated, and in the absence of localizing signs the diagnoses were sometimes confused. Coincident renal symptoms were present in a few cases and extension to the stomach or duodenum not infrequently produced confusing upper gastro-intestinal symptoms. Their location high under the costal margin was responsible no doubt in a few instances for failure to palpate the primary growth. As in other locations, the diagnosis was most constantly made by the X-ray.

Treatment.—Resection of the right colon was performed in three of the five cases resected. This was performed in the same manner as that for tumors of the cæcum and ascending colon, including a radical dissection of the seat of bowel attachment followed by lateral ileocolostomy. Resection with end-to-end anastomosis was performed in two cases. It is impossible to evaluate the operative procedures as shown by the small number of cases in this series. The former method has been accepted by operators at large and is generally conceded to be the method of choice.

Prognosis.—Judging from the results as shown by this series, the outlook of carcinomas of the hepatic flexure is extremely poor. Only one-third of the total number were operable. One of these refused operation and five were resected. Three of the five died from a recurrence of the growth and the ultimate results of the remaining two were not obtained. Late recognition and early metastasis were in part responsible for these results, figures which are not in keeping with modern surgical practice.

Emphasis should be laid upon the high post-operative mortality after palliative procedures. Of the eleven inoperable cases upon whom exploratory laparotomy, colostomy or entero-enterostomy was performed, 54.5 per cent.

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Prognosis.—In spite of delayed diagnosis, 52 per cent. of the cases in this location were operable. Fifteen, or 40 per cent., of the thirty-eight cases surviving operation are presumably well. Three factors were found which may in part account for this favorable prognosis; the infrequency of distant metastases enhanced the removal of all diseased tissue. The rate of growth was slow. Finally, histological examination revealed that a high precentage of these tumors were of low-grade malignancy.

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† This case was treated by radium and deep X-ray and is living at present two years after operation.

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Treatment.—Resection of the right colon was performed in three of the five cases resected. This was performed in the same manner as that for tumors of the cæcum and ascending colon, including a radical dissection of the seat of bowel attachment followed by lateral ileocolostomy. Resection with end-to-end anastomosis was performed in two cases. It is impossible to evaluate the operative procedures as shown by the small number of cases in this series. The former method has been accepted by operators at large and is generally conceded to be the method of choice.

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Emphasis should be laid upon the high post-operative mortality after palliative procedures. Of the eleven inoperable cases upon whom exploratory laparotomy, colostomy or entero-enterostomy was performed, 54.5 per cent.

died following the operation. It is true that the majority of these patients were in the terminal stages of malignant disease but, as eminent operators have pointed out, no operation is justified in such cases. Certainly such a high mortality does not justify surgical interference unless the presence of obstruction makes it imperative.

The operative procedures and results of treatment are summarized in Table VIII.

TABLE VIII

Carcinoma of the Hepatic Flexure

Results of Treatment

Operation	Dead Following Operation	Dead from Late Effects of Tumor	Presumably Well *	Unknown	Total
Palliative operations, inoperable	5	4	0	1	10
Resection with lateral anastomosis	0	0	0	0	0
Resection with end-to-end anastomosis	0	1	0	1	2
Resection right half of colon	1	2	0	1	4
Operation refused	0	1	0	1	2
Total	6	8	0	4	18

* Includes all cases living without evidence of recurrence.

TRANSVERSE COLON

It is difficult to comprehend why malignant growths are comparatively rare in the transverse colon. Only fourteen, or 7.4 per cent., originated in this location, an incidence only slightly exceeding that of the small intestine. It has been suggested that greater functional activity predisposes to immunity, but this point cannot be proved.

Pathologically, the tumors frequently assumed the annular form. Constriction of the lumen in this manner was present in six of the fourteen cases. In other instances the tumor was polypoid, fungating, or sessile and limited to one wall of the bowel. Extension into the mesentery was not uncommon. No less than 43 per cent. of the tumors had involved the stomach by direct extension, accounting no doubt for the referred symptoms of gastric pathology. Histologically, the majority were adeno-carcinomas with subsequent mucoid degeneration in a high percentage of cases. The eleven tumors from which specimens were obtained were distributed as follows:

Histological Distribution

Histological Type	Number of Cases	Percentage
Adeno-carcinoma, all grades	2	18.2
Adeno-carcinoma with mucoid degeneration	7	63.2
Scirrhous carcinoma or carcinoma with fibrosis	1	9.1
Medullary or cellular carcinoma	1	9.1
Total	11	100.0

Metastases.—The transverse colon, like the ascending, is devoid of an abundant lymphatic supply and the percentage of metastases was not extremely high. Secondary growths were distributed as follows:

Location of Metastases

Location	Number of Cases	Percentage
Lymph nodes	4	28.6
Liver	1	7.1
Other locations	0	0.0

Clinical Aspects.—The symptoms of carcinomas of the transverse colon were not infrequently those of upper abdominal pathology. The nausea, vomiting, epigastric pain and achlorhydria occasionally simulated gastric malignancy. Palpable masses were sometimes thought to be located in the stomach and röntgenographical defects were seen in that organ. The pain and jaundice of gallbladder disease likewise complicated the picture in certain instances.

Anæmia, usually present, was not so marked as that exhibited by cancer of the right colon. Obstructive symptoms were more frequent than in the two previous locations but did not occur with the regularity of left-sided neoplasms. Blood, seldom noticed in the stool grossly, was almost uniformly found by micro-chemical tests. Sluggishness of bowel habit was the rule, although diarrhœa was noted in a few cases.

Treatment.—The surgical procedures most commonly used for removal of the growth were simple resection and right colectomy. The advantages of the second method have been discussed previously. In the application of the first technic, it was found that tension on the suture line and impaired blood supply contributed largely to post-operative casualties in a few instances. The first is avoided by adequate mobilization and meticulous selection of the point for division. Not infrequently, the removal of a wide margin of normal bowel prevented the approximation of the blind ends without tension. The transverse colon is supplied largely by the middle colic vessels and their branches. Unless these are carefully segregated and ligated at the optimum points the viability of the stumps may be impaired.

The method of anastomosis was governed by conditions at the time of operation and the preference of the operator. The lateral iso-peristaltic method gave excellent results where mobilization was adequate. Sacculation was avoided by suturing down the blind ends, but in spite of this precaution the stumps broke down in a few instances, permitting leakage with subsequent peritonitis. The end-to-end anastomosis, resorted to when approximation was restricted, proved relatively safe from the standpoint of immediate mortality but the percentage of recurrences after this procedure was high.

Bloodgood devised in 1906 a method of anastomosis to overcome leakage from the bowel stumps after lateral union. He sutured the ends together in an antiperistaltic manner, but, in closing the abdomen, brought the two ends outside the peritoneum and sutured them into the wound. Leakage there-

from could result in nothing more harmful than infection of the abdominal wall or a fæcal fistula. This method was used several times by the originator with no operative casualties but was practiced on none of the cases in this hospital.

Prognosis.—The operability in this group was high, 85.7 per cent. being resected. The results, however, were poor. Of the fourteen cases, three died after operation, and three died from recurrence or late effects of the tumor. four are living but only two of these have passed the five-year period. The frequent invasion of the stomach is no doubt responsible in great part for this since such extension may necessitate a partial gastrectomy as well as colectomy. The results of treatment are summarized in the subsequent table.

TABLE IX

Carcinoma of the Transverse Colon

Results of Treatment

Operation	Dead Following Operation	Dead from Late Effects of Tumor	Presumably Well *	Unknown	Total
Palliative operations, inoperable	0	2	0	0	2
Resection with lateral anastomosis	3	1	1	1	6
Resection with end-to-end anastomosis	0	0	3	1	4
Resection right half of colon	0	0	0	1	1
Operation refused	0	0	0	1	1
Total	3	3	4	4	14

* Includes all cases living without evidence of recurrence.

SPLENIC FLEXURE

The majority of these neoplasms were annular and constricting with surface ulceration of varying degree. The large fungating types common to the right colon were rarely found. The adeno-carcinomas predominated histologically, as may be seen by the accompanying table.

Histological Distribution

Histological Type	Number of Cases	Percentage
Adeno-carcinoma, all grades	7	77.8
Adeno-carcinoma with mucoid degeneration	1	11.1
Scirrhous carcinoma or carcinoma with fibrosis	1	11.1
Total	9	100.0

Metastases.—Metastases were uncommon. The majority of late deaths were due to recurrence of the growth, caused, no doubt, by the frequent extension to adjacent structures with coincident difficulties of complete removal. Only one of the eleven cases had metastasized, whereas six had extended to other structures.

Clinical Aspects.—Eleven carcinomas were found within the arbitrary limits of the splenic flexure. They differed little symptomatically from those

Location of Metastases

Location	Number of Cases	Percentage
Lymph nodes	1	7.1
Liver	0	0.0
Other locations	0	0.0

of the transverse colon. Pain was a fairly constant symptom and usually limited to the left side of the abdomen. Distention, meteorism and borborygmus were common. Obstruction of a chronic nature was characteristic and peristaltic waves were sometimes seen in thin patients. The general symptoms were similar to those produced by malignancies in other locations but less severe than those of right-sided malignancy.

Occult blood in the stools was almost constant and in a few instances gross blood could be seen. Palpation of a tumor was difficult because of its location high under the costal margin and for this reason diagnosis was usually delayed until the symptoms of obstruction and melæna had justified röntgenographical studies.

Treatment.—Simple one-stage resection was performed in three of the four cases in which extirpation could be done. The end-to-end anastomosis was used in two instances and the lateral method in one. Although it was not used, the mobility of the bowel lends itself well to the "thumb anastomosis" of Bloodgood.

The Mikulicz operation is also adapted to resection of this portion of the bowel, but must be limited to those cases in which the tumor with its adjacent bowel can be withdrawn through the abdominal incision. The method has the advantage of dividing the operation into three stages, two of which can be performed under local anæsthesia, thereby lowering the risk of postoperative shock. Various authors have commented upon the tendency to recurrence in the abdominal wound and concur in their belief that its use should be restricted to those cases which are well circumscribed and show no signs of extension beyond the normal limits of the bowel.

TABLE X

Carcinoma of the Splenic Flexure

Results of Treatment

Operation	Dead Following Operation	Dead from Late Effects of Tumor	Presumably Well *	Unknown	Total
Palliative operations, inoperable	2	4	0	1	7
Resection with lateral anastomosis	0	0	0	1	1
Resection with end-to-end anastomosis	1	1	0	0	2
Two-stage Mikulicz resection	1	0	0	0	1
Total	4	5	0	2	11

* Includes all cases living without evidence of recurrence.

Prognosis.—In only 44.5 per cent. of these cases was resection thought possible. As was so often the case, the advantages of mobilization and acces-

sibility at the time of operation were offset by the absence of indicative signs early in the course of the disease.

The results of the operations performed are shown in Table X.

DESCENDING AND SIGMOID COLON

Carcinomas of the descending colon and sigmoid were practically always annular and constricting in type. Ulceration, marked in a large proportion, was responsible for the fairly constant presence of blood in the stools and coincident secondary anæmia. Adeno-carcinomas predominated among the histological types. Those characterized by the production of extensive fibrosis forming the so-called scirrhous growths were quite common, especially among the constricting "napkin-ring" carcinomas. Mucoid degeneration was not found with the constancy shown in the transverse colon. The tumors from which pathological specimens were available were of the following types:

Histological Distribution

Histological Type	Number of Cases	Percentage
Adeno-carcinoma, all grades	16	48.5
Adeno-carcinomas with mucoid degeneration	10	30.3
Scirrhous carcinoma or carcinoma with fibrosis	7	21.2
Total	33	100.0

Metastases.—Regional metastases were not extremely common, being noted in only 19.4 per cent. of the cases. Distant metastases occurred in the liver and other regions less frequently.

Location of Metastases

Location	Number of Cases	Percentage
Lymph nodes	14	19.4
Liver	5	6.9
Other locations	7	9.7

Clinical Aspects.—In view of their gross pathology, the clinical manifestations of this group of tumors were primarily those of obstruction, either complete or partial. Nausea and vomiting were uncommon and although appetite was usually retained, it was frequently unsatisfied on account of subsequent discomfort. Loss of weight and other general symptoms of malignancy were not so marked as when accompanying right-sided malignancy. Tenesmus was a frequent and annoying symptom. Patients frequently complained of inability to relieve themselves by defecation. Bowel habit consisted largely of frequent small stools but no actual diarrhœa. Gross blood was seen in many instances, giving the stools a dark color and tarry consistency.

Palpation was possible in the majority of cases but accurate definition was sometimes impossible due to the location below the pelvic brim.

The diagnosis of a suspected tumor was confirmed by röntgenograms following a barium enema in approximately 95 per cent. of the cases.

Treatment.—The operative treatment was influenced by the location and accessibility of the growth. When located high in the descending colon, simple resection with end-to-end or lateral anastomosis was most popular. The Mikulicz operation was used in six cases with the result shown in Table XI.

Possessing no true mesentery, difficulties of mobilizing the sigmoid colon were frequently encountered. The end-to-end anastomosis was necessitated in the majority of cases for this reason. The "tube anastomosis" devised by Balfour finds its greatest use in this location and was performed in a few instances with good post-operative results.

The aseptic anastomosis of Parker-Kerr is advocated by some operators. The results of this series show little in its favor, however, and it is believed that too often the more important factors of mobilization and preservation of blood supply are neglected for strict asepsis. The most satisfactory results were obtained by the open end-to-end union.

Prognosis.—As might be expected, the results of treatment varied in the two previously mentioned locations. When located high the operative mortality was only 9 per cent. Of twenty-three tumors in the sigmoid which were resected, the alarming number of fourteen died from the effects of the operation, thus illustrating clearly the greater technical hazards of the latter location. The Mikulicz operation was used in six cases. Two of these died before leaving the hospital, two died with a recurrence of the growth and two are living less than five years without evidence of reappearance. 47 per cent. of the sixty-seven cases were operable. Although the immediate mortality was relatively high, 40 per cent. of the cases surviving resection are presumably well.

Table XI illustrates the operative results for the group.

TABLE XI

Carcinoma of the Descending Colon and Sigmoid

Results of Treatment

Operation	Dead Following Operation	Dead from Late Effects of Tumor	Presumably Well *	Unknown	Total
Palliative operations, inoperable....	7	15	0	16	38
Resection with lateral anastomosis .	4	2	3	3	12
Resection with end-to-end anastomosis.....	5	4	7	0	16
Two-stage Mikulicz resection.....	2	2	2	0	6
Total.....	18	23	12	19	72

*Includes all cases living without evidence of recurrence.

The disposition of the entire 192 cases is given in Table XII. This table summarizes the treatment of all cases whether operable or hopeless and the results as well as are known. In view of the great confusion existing regarding the clarity of statistical figures, a word of explanation is relevant. A

TABLE XII

Carcinomas of the Entire Colon

Results of Treatment

Result	Dead Following Operation	Dead from Recurrence	Dead from Effects of Carcinoma	Well 5 Years or More	Living Less Than 5 Years, No Recurrence	Not Traced	Total
Inoperable, no operation	0	0	11	1*	0	15	27
Inoperable, exploratory laparotomy	9	0	19	0	0	7	35
Inoperable, colostomy	11	0	8	0	0	6	25
Inoperable, entero-enterostomy	2	0	5	0	0	1	8
Total inoperable cases	22—23.2%	0— 0.0%	43—66.2%	1— 1.5%	0— 0.0%	29—30.5%	95—49.5%
Resection, lateral anastomosis	11	4	0	6	9	11	41
Resection, end-to-end anastomosis	9	10	0	10	3	2	34
Mikulicz operation	3	2	0	0	2	0	7
Resection right colon	3	4	0	1	2	3	13
Total operated cases	26—27.4%	20—37.7%	0— 0.0%	17—32.1%	16—30.2%	16—16.8%	95—49.5%
Operable, operation refused	0	0	1	0	0	1	2— 1.0%
Grand Total	48—25.0%	20—13.7%†	44—30.1%	18—12.3%†	16—10.9%†	46—23.9%	192

* Doubtful diagnosis.

† These percentages are computed from the total number of cases under observation on whom accurate follow-up data were obtained.

lamentably high percentage of cases were not followed, chiefly through lack of coöperation by the patient. To arrive at accurate percentages, one must exclude this group. To compute the percentage of five-year arrests, only those cases surviving operation should be considered. Since this would entail an intricate series of figures, the values have been given in actual numbers of cases and the percentages figured on the basis of the total number of cases admitted.

Comment.—Operability figures cannot always be taken as accurate indices of the condition of neoplastic growths since these may vary markedly with different operators. As found in this series, however, the values indicated a gradual increase in the operability of large bowel cancer. For example, during the five-year period from 1900 to 1905, only 24.1 per cent. were operable while for a similar period between 1925 and 1930 the rate had risen to 65.5 per cent. The results of treatment show the same trend. In the above-mentioned five-year periods, the percentage of five-year cures has increased from 14.6 per cent. to 28 per cent. of all resected cases, and the post-operative mortality has decreased from 31 per cent. to 17.3 per cent. Thus while the results over the entire forty-two-year period may seem poor as a whole, the later cases have been more gratifying.

The comparative efficacy of the lateral and end-to-end anastomoses has frequently been questioned. It is ordinarily thought that the lateral union has a lower immediate mortality and for this reason is used wherever approximation is possible. Analyzing the results of these two methods as shown in this series, two interesting features are found.

Results of Lateral and End-to-End Anastomoses

Result	Lateral	End-to-End
Presumably well	50%	41%
Operative mortality	24%	9%
Dead from recurrence	14%	32%
Total (number of cases resected upon whom data were obtained)	30	32

The results of these figures show conclusively that the operative mortality was greater following the lateral than the end-to-end union. This was attributed largely to leakage from the blind ends. These, it must be emphasized, are artificially closed blind pouches which are easily distended. The end-to-end method, on the other hand, most nearly approaches the normal condition of the bowel and although the opportunity for immediate soiling is greater, the danger of subsequent leakage is less than in the former procedure.

Recurrence of the growth followed the end-to-end anastomosis more than twice as frequently as the lateral. This is believed to be influenced by the following factors: large invasive growths necessitate a wide resection after which approximation for the lateral union is difficult. Hence the former method is used through force of necessity. When the growth is small and localized, the second method may be used with impunity for the same reason. One may fairly assume, therefore, that since recurrences are fewer after

this type of tumor, the better late results are due to the type of growth rather than the method of anastomosis.

The value of colostomy either as a preliminary measure to resection or a palliative procedure has often been a subject of discussion. In the first case, it is generally conceded to have a beneficial effect on the success of the operation. Two definite ends are obtained: The diseased bowel is put at rest and cleansing of the operative field is permitted, thereby reducing the chance of infection and its effect upon the integrity of the suture line. The second feature is the relief of obstruction, either partial or acute, and the removal of its deleterious effects upon the general condition of the patient. Although a relatively simple procedure, the dangers of this operation have no doubt been overlooked by many. Of twenty-five colostomies, both palliative and preliminary, eleven, or 44 per cent., died from the effects of the the operation. It is true that some of these patients were in the terminal stages of the disease and would probably have died in the hospital without surgical interference. Nevertheless, it is obvious that such a mortality rate does not justify the procedure. It has been pointed out that a great many of these post-operative deaths are caused by placing the colostomy too near the point of resection, and for this reason, many operators now prefer to open the bowel at some distance from the lesion. Appendicostomy is used in some clinics with excellent results. Others advocote ileostomy at a point well above the ileocæcal valve. The Witzell tube enterostomy has been advantageously used. These methods, while accomplishing the same result, can definitely lower the mortality rate of colostomy. Nevertheless, there are certain cases in which the palliative operation is contra-indicated. Obviously the procedure is not justified in patients with advanced disease unless obstruction is acute. The operable cases in which it is used can be restricted to those who, in the opinion of the operator, will have a smoother post-operative recovery thereby.

It is impossible to foretell the result of operation in any case. That post-operative mortality is due to many and variable factors, some of which the operator can in no way control, can be appreciated from the following tabulation of causes of death after operation.

Causes of Operative Mortality

Cause	Number of Cases	Percentage
Peritonitis	15	31.9
Shock	7	14.9
Intestinal obstruction	6	12.7
Pneumonia	5	10.6
Embolus	3	6.4
Cardiac failure	2	4.3
Infection other than peritonitis	2	4.3
Lung abscess	1	2.1
Uræmia	1	2.1
Unknown	5	10.6
Total	47	100.0

Irradiation has been used in the treatment of bowel cancer so rarely that it is impossible to determine its value. Nevertheless, in certain types of cases radium or X-ray has been of great benefit. Hopelessly inoperable cases have been relieved of their symptoms and the life span extended. One such case occurred in this series in which following the use of radium the patient lived four years in relative freedom from symptoms. Large adherent tumors, seemingly inoperable at first examination, have been reduced to an operable stage. Radium and X-ray without doubt have a definite place in the treatment of intestinal cancer and their value should not be overlooked.

INTRAPERITONEAL VACCINATION IN SURGERY OF THE COLON

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Postoperative, fatal peritonitis is probably more common in all varieties of surgery of the colon than in any other type of abdominal operation, and is a factor which contributes importantly to the relatively high mortality rates for these procedures. Repeated experimental studies have been made in an attempt to anticipate the contamination which often occurs during or after operation, and to protect the peritoneum against it. Earlier methods[2, 5] employed the principle of injecting various irritants into the peritoneal cavity to increase leucocytosis, and this procedure was used clinically by von Mikulicz. Striking protection against peritonitis was not obtained by this method, however, and more recent workers have secured conclusive immunization both experimentally and clinically by the intraperitoneal injection of living bacteria, as well as a vaccine prepared from heat-killed colon bacilli and streptococci.

Herrmann[1] conducted a series of experiments upon rabbits and found that a combined vaccine of streptococci and colon bacilli gave more striking immunization than did a vaccine prepared from colon bacilli alone. His work furnished the background for the clinical application made by Rankin and Bargen[3, 4] who reported sixty cases and later a much larger series of operations upon the colon at The Mayo Clinic, in which they felt that intraperitoneal vaccination had been an important factor in preventing peritonitis and lowering the mortality rate. Steinberg[6, 7, 8, 9, 10] and his associates have made repeated experimental studies with the injection of both living bacteria and vaccine. They differentiate between a true immune process and the protection to the peritoneum which Steinberg[8] designates "hyperleucocytic pre-immunity." In the true immune process the intraperitoneal injection of a vaccine produces a generalized immunity which the peritoneum shares, and protection is due to local hyperleucocytosis. This occurs, however, only after several days' time. In hyperleucocytic pre-immunity, the leucocytes appear often within a few hours of the time of injection of the protective material, a fact which argues against the probability of its being true immunity. Steinberg[8] has also shown that immunization against peritonitis may be created by subcutaneous injections of vaccine although the protection is slight in degree and appears only after a week or more following vaccination. The only specific contraindication to the use of the vaccine is an existing peritonitis; in other words, the procedure is a prophylactic one and not curative.

Through the courtesy of Doctor Steinberg, we have had available during the past year a supply of the bacterial antigen prepared from heat-killed colon bacilli according to Steinberg's method. It is known as Coli-Bactragen and consists of 200,000,000 heat-killed *B. coli* per cc. suspended in 1 per cent. gum tragacanth in normal salt solution prepared in ampoules of 30 cc. each. This comparatively large amount of fluid probably allows extensive diffusion of the vaccine throughout the peritoneal cavity. The combination of gum tragacanth and the killed bacteria prevents too rapid passage of the antigen from the peritoneum during the period of greatest phagocyte increase. Other vaccines in use consist of suspensions of killed organisms in saline or distilled water and the antigen is rather quickly carried into the general circulation with the result that there is relatively little local leucocytosis in the peritoneal cavity. The true immunity which appears after several days is of a mild degree and is of doubtful value for local protection.

The injection of the contents of the entire ampoule is made with a spinal puncture needle in the midline of the abdomen, slightly below the umbilicus after the bladder has been emptied, and approximately forty-eight hours prior to the planned time of operation. This time can be easily gauged in most cases since several days are used for the general preparation of the patient when resection of the colon is planned. Small doses of magnesium sulphate are given hourly for several days and the colon is emptied daily by an enema. A diet high in vitamins and calories and with a low residue is given, and the patient is urged to eat large amounts of candy to increase his glycogen reserve. Blood transfusions are given when there is an appreciable anemia from chronic hemorrhage.

TABLE I

Preoperative Diagnosis of Patients Receiving Preoperative Vaccination with Coli-Bactragen

Diagnosis	*No. of Cases*
Carcinoma of rectum and sigmoid	55
Carcinoma splenic flexure and transverse colon	4
Carcinoma caecum, ascending colon and hepatic flexure	10
Fecal fistula	2
Gastro-jejuno-colic fistula	3
Chronic intestinal obstruction	5
	79

Material.—This report consists of seventy-nine patients vaccinated with Coli-Bactragen approximately forty-eight hours prior to the time of operation upon the colon. The preoperative diagnosis (Table I) was in most instances carcinoma, fifty-five occurring in males and twenty-four in females. The response to vaccination noted clinically is indicated in Table II. Abdominal pain was absent in one, slight in seventeen, moderate in forty-one and severe in twenty. The pain was noted within two or three hours after injection in most cases and persisted for varying periods up to thirty or forty

hours. Repeated doses of morphine were required to relieve pain in more than half of the cases. Distention and abdominal rigidity was not noted in six cases, was slight in forty, moderate in thirty-one and striking in two cases. Heat to the abdomen gave relief in most instances.

TABLE II

Data from Observations Made Soon after Intraperitoneal Injection of Coli-Bactragen and at Operation

Pain: Absent	1	*Distention:* Absent	6
Slight	17	Slight	40
Moderate	41	Moderate	31
Severe	20	Severe	2
Average rise in temperature			101.8°
Average increase of pulse			104 per minute
Average rise in white blood count			16,900
Peritoneal reaction (noted at operation):			
Hyperemia	58		73 per cent.
Increased fluid	25		31 per cent.
Plastic exudate	19		24 per cent.

Rise in temperature was noted in most patients within a four-hour period and reached an average maximum of 101.8°, the highest being 103.6°. A return to near normal was the rule during the immediate preoperative period. An increased pulse rate accompanied the fever as a rule, in one instance to 140, the average being 104. Repeated leucocyte counts showed an increase to an average maximum of 17,000 although in several patients the white blood count remained normal throughout. One patient, whose leucocyte count reached 40,000, had an accompanying temperature of 103° and pulse increased to 130 per minute.

At the time of operation, an attempt was made to estimate the degree of peritoneal reaction as shown by hyperemia of the visceral peritoneum and omentum, increased fluid or the presence of a plastic exudate. Fifty-eight, or 73 per cent., showed definite hyperemia with injection of the bowel, omentum and mesentery. Increased peritoneal fluid was present in twenty-five, or 31 per cent., and a true exudate with deposits of fibrin was seen in nineteen, or 24 per cent. In the latter cases the appearance was that of generalized peritonitis.

The operative procedures are indicated in Table III. The thirty-six combined abdomino-perineal resections for carcinoma of the rectum and sigmoid were in most cases one-stage operations, although a preliminary colostomy was done in two cases. Primary anastomosis was done following resection of the right colon in four cases, while a modified Mikulicz obstructive resection was employed for eight lesions of the transverse and left colon down to the sigmoid. Seventeen palliative colostomies and seven side-tracking anastomoses were done for lesions with extensive infiltration or distant metastases. The miscellaneous group includes the non-malignant lesions and those neoplasms in which no palliation was thought practical.

TABLE III

Operative Procedures in Patients Vaccinated with Coli-Bactragen

Operation:	
Combined abdomino-perineal resection rectum and sigmoid	36
Resection of colon and primary anastomosis	4
Obstructive resection of colon (Mikulicz)	8
Palliative colostomy	17
Palliative side-tracking anastomosis	7
Miscellaneous	7
	79

Results.—An uneventful and uncomplicated postoperative course occurred in 56 or 70 per cent. of all cases (Table IV). Twelve, or 15 per cent., had a prolonged or complicated convalescence, due in most cases to infection in the region of the colostomy or in the perineal wound, but with total absence of any signs of peritonitis.

TABLE IV

Post-operative Course in Patients Vaccinated with Coli-Bactragen
(One Fatal Case Was Not Operated Upon)

Uncomplicated convalescence	56	70 per cent.
Complicated or prolonged	12	15 per cent.
Deaths	11	14 per cent.

Eleven deaths occurred in the group, ten following operation, one case being in too poor general condition to permit operation. Of these, three were pulmonary deaths, two having lobular pneumonia and one with pulmonary infarctions and multiple lung abscesses. Intestinal obstruction developed in three cases and was the immediate cause of death, at five, twenty-one, and fourteen days respectively, after operation. No peritonitis was found in these patients at the second operations done for relief of the obstruction. Death occurred nine days and fifteen days after side-tracking anastomoses for hopeless carcinoma in two patients who had progressive cachexia and a downhill course. One death occurred four days after operation. Although an autopsy was not done, the clinical picture was not that of peritonitis. In one patient who had had a combined abdomino-perineal resection, autopsy showed a fibrino-purulent peritonitis, death having occurred on the eleventh postoperative day. The source of the infection, however, was found to be due to a defect in the perineal wound where there was a large opening into the peritoneal cavity with failure of healing. This should probably then be considered secondary peritonitis rather than peritonitis from operative contamination.

Comment.—For a field of surgery as hazardous as major procedures upon the colon and rectum, any preoperative measure which may extend the margin of safety must be given careful consideration. Meticulous preparation of the bowel itself by catharsis, enemata, and a low residue diet is of the greatest importance. Any preparation of the bowel or peritoneum cannot be expected to give protection against gross fecal contamination such as occasionally occurs due to technical errors or accidents. The unprepared peritoneum, however, tolerates even minor degrees of contamination or infec-

tion much less well than when there has been some previous reaction within the peritoneal cavity. This is well illustrated in closure of a fecal fistula, in which, although the general peritoneum may be thoroughly exposed to contamination, general peritonitis practically never occurs. Preparation of the peritoneum by vaccination probably has its greatest usefulness in preventing peritonitis due to slight contamination such as occurs through a microscopic perforation of the bowel at a tumor site or through the trauma to a dilated and weakened portion of bowel incidental to its surgical removal. It is in these instances that a previous peritoneal reaction with hyperleucocytosis is of real value to the peritoneum in its defense against infection.

SUMMARY

(1) Intraperitoneal injections of Coli-Bactragen (Steinberg) were given to seventy-nine patients, most of whom required major operations upon the colon.

(2) A favorable clinical response and striking peritoneal reaction (seen at operation) was observed in practically all cases. This ranged from mild hyperemia of the peritoneum to the production of an abundant exudate, in some instances giving the appearance of a true fibrino-purulent peritonitis.

(3) Peritoneal vaccination is of questionable value in protecting the peritoneum against gross fecal contamination. Its usefulness has been demonstrated as an aid to the peritoneum in its defense against minor degrees of soiling and infection.

(4) Although this report is based upon a relatively small number of cases, the low incidence of peritonitis (one case in this group) appears to justify the procedure as a valuable adjunct in the preparation of patients for operations upon the colon.

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OMENTOPEXY IN PORTAL CIRRHOSIS OF THE LIVER WITH ASCITES

A REVIEW OF TWENTY-THREE CASES

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The value of omentopexy in portal cirrhosis with ascites has long been a matter of controversy. By omentopexy is meant the Talma-Morison operation with its various modifications. Strikingly contradictory conclusions as to its efficacy are found in the literature. It has seemed worth while therefore to review the cases operated on at this hospital.

The first omentopexy for portal cirrhosis with ascites was performed by Van der Meulen in 1889 at the suggestion of Talma of Utrecht. The result was unsuccessful, the patient dying from shock. The first successful case was operated on by Rutherford Morison[1] in 1895. Unaware of Talma's work he and Drummond had conceived of the operation as a result of their findings in autopsies on cases of cirrhosis of the liver. They had repeatedly found a collateral circulation established through the omentum which had become adherent to the parietal peritoneum, and were consequently led to devise an operation which would accomplish the same result. Their case lived in good health for two years after operation without a return of ascites, and then died following an operation for ventral hernia. Since this time many series of cases have been reported with widely varying results. In 1904, Monprofit[2] claimed 31 per cent. cures in 224 collected cases. By cures he meant either disappearance of ascites or arrest of hemorrhage. His follow-up reports were scanty. Bunge[3] reported 33 per cent. cured of ascites but also failed to give adequate post-operative results. In 1906, White[4] revised these series of cases and listed eighty-four out of 227, or 37 per cent., as cured. Only 12 per cent. of these cases, however, were followed as long as a year. Mayo[5] reported forty-seven cases, with improvement in some instances, but did not give the late results. In 1926, Tempsky[6] noted complete recovery or a decided improvement in 28 per cent. of twenty-five cases. His post-operative observations ranged from eight months to twelve years. In a series of twenty-nine cases reported in 1930 Bricher[7] found 48 per cent. free from ascites and working regularly two years after operation. On the other hand Greenough,[8] in a collected series of 105 cases, found only nine or 8 per cent. definitely improved after two years. Gibbon and Flick,[9] reporting ten cases of their own, found only one relieved of symptoms. In a recent comprehensive article Hughson[10] reported a series of twenty-six cases in which various operative procedures were used. Omentopexy was done in twelve of these. None showed any benefit from the operation.

As Hughson has recently pointed out, the discrepancy in results is probably due to lack of adequate follow-up reports and to failure to discriminate accurately between portal cirrhosis and other conditions such as polyserositis, Banti's disease, tuberculous peritonitis, syphilitic cirrhosis, biliary cirrhosis and cardiac insufficiency with enlarged liver and ascites. Every effort has been made, therefore, in this review to omit cases in which the diagnosis seemed in doubt. All cases of portal cirrhosis with ascites treated in this hospital in the last eighteen years on whom an omentopexy was performed have been reviewed. Cases have been included only after careful study of the history, the clinical findings, and the pathology found at operation with reference to the liver and spleen, the character of the peritoneum, evidence of collateral circulation, and the presence of free fluid. In six cases specimens of tissue removed from the liver at operation confirmed the diagnosis. In only two cases was a post-mortem examination obtained. Differentiation between portal cirrhosis with secondary splenic enlargement and the syndrome known as Banti's disease is difficult and perhaps impossible. There has been increasing doubt among many pathologists as to whether Banti's disease really exists as a separate disease entity. One case that may belong to this syndrome in which omentopexy alone was done and a typical cirrhotic liver as well as an enlarged spleen found at operation, was included here. All other cases in which splenectomy had been done in addition to omentopexy were omitted.

Present Series.—There were thirty-three cases in all on whom an omentopexy was performed because of an ante-operative diagnosis of portal cirrhosis with ascites. Most of these were operated on by Dr. Allen O. Whipple and Dr. Ellsworth Eliot. Ten have been omitted from the study because of doubt as to their proper diagnosis, or because some other operative procedure was done in addition to omentopexy. Two of these on whom a splenectomy was done as well were thought to be examples of Banti's disease. In another omentopexy had been supplemented by the implantation of the saphenous vein into the peritoneum, as proposed by Ruotte.[11] Neither procedure influenced the ascites. In three cases the peritoneum was markedly thickened and suggested the "iced liver" of polyserositis (Pick's disease). One case was found to have a fibrosarcoma of the spleen from examination of tissue removed at operation. Two cases had cardiac insufficiency with ascites. Another proved to have a toxic hepatitis without ascites. No cases of biliary cirrhosis or of cirrhosis of apparent syphilitic origin were operated on.

The present report is based on a study of the remaining twenty-three cases. There were fifteen males and eight females. The average age at operation was forty-one, the youngest twelve years and the oldest sixty-eight years. The decades were represented as follows: first, one case; second, two cases; third, six cases; fourth, four cases; fifth, seven cases; sixth, three cases. The nationalities represented were: United States, six; German, four;

Italian, five; British, three; Chinese, two; South American, two; Czecho-Slovakian, one; Roumanian, one.

The onset was characterized by swelling of the abdomen in twelve cases; edema of the ankles and mild digestive symptoms in four cases each; and jaundice, loss in weight and hematemesis in one each. In two cases it was immediately preceded by an acute respiratory infection. The average duration of symptoms before operation was eleven months. Ten cases, or 43 per cent., gave a definite history of excessive use of alcohol. Only two cases had a positive blood Wassermann. Infection of the gall-bladder as a primary or secondary factor in the cirrhosis was not suggested by the symptomatology or the operative findings in any case. Jaundice was found in only five cases, or 21 per cent., and was of a mild degree. Clinical evidence of ascites was present in every case before operation and was confirmed later at operation in every instance. The average duration of ascites before operation was six months. Every case except three had had abdominal paracentesis done at least once before operation. The average number of paracenteses before operation was five. One case was tapped twenty-eight times before operation. Exploration of the abdomen in this case showed the typical hob-nail liver of portal cirrhosis without evidence of polyserositis as might have been expected from the numerous tappings. Reaccumulation of fluid after operation was common. Omitting the six cases that died soon after the operation, the remaining seventeen were tapped on an average of three times. Only four of these cases failed to accumulate enough fluid after operation to necessitate removal.

Hematemesis was reported in only one case, which alone of the series seemed to fall into the group commonly known as Banti's disease. A splenectomy had been planned in addition to omentopexy, but was not done because of extensive adhesions about the spleen. In only three cases were hemorrhoids noted. Enlarged and dilated superficial abdominal veins were seen before operation in nine cases. Enlarged intra-abdominal veins suggesting an increased collateral portal circulation were noted at operation in seven cases. The round ligament and the omentum were most frequently involved. A typical caput medusa was not found in any of the cases. The liver appeared grossly cirrhotic in every instance. Specimens of tissue removed at operation in six cases gave a corresponding microscopic picture. In ten cases the liver was definitely enlarged; in thirteen it was either normal in size or smaller than normal.

The operation used was either the Schiassi modification of the Talma-Morison technic with suture of the omentum to the parietal peritoneum or other variations in which the omentum is placed in the properitoneal tissues or in or between the split rectus muscle fibres.

Results.—Follow-up results were obtained in twenty-two of the twenty-three cases. One case was lost to follow-up soon after operation and has not been included in the following discussion. Six cases died within eleven days of operation and were classed as operative deaths. Of the remaining

sixteen cases two are still living, two have been lost after a follow-up of one year, and twelve have been followed to their deaths. The longest follow-up was seventeen years and the average over two years. Results were grouped under three headings, "symptom-free," "improved," and "unimproved."

There were two cases, or 9 per cent., which were classed as "symptom-free." These cases were followed for seventeen and five years, respectively. The seventeen-year follow-up patient recently had a questionable slight return of ascites following a period of dietary indiscretion and abuse of alcohol, but is now free of symptoms. The other when last seen had no indigestion and showed no evidence of ascites.

Seven cases, or 32 per cent., were classed as "improved." One of these apparently entirely recovered after operation, returned to work and remained free from indigestion and ascites for ten years and then finally died six months after a return of these symptoms. Another who had had repeated attacks of hematemesis before operation was apparently in excellent health for three years after operation and then died suddenly from a severe hemorrhage. Two of these cases continued to reaccumulate peritoneal fluid after operation but lived for two and one-half years and twenty-two months respectively, which is an unusually long time for untreated cases of portal cirrhosis to survive once ascites has developed. The remaining three cases showed a marked decrease in the rapidity of fluid accumulation following operation. One had required eight tappings in the three months preceding operation, but required no further aspiration during the following year that it survived. Another was aspirated thirty-three times in the eleven months before operation and only twice after operation in the succeeding six months before death. The third was tapped twenty-eight times with increasing frequency over a period of three years. Reaccumulation was apparently less rapid after operation and she lived for one and one-quarter years, finally dying of a respiratory infection. It is, of course, incorrect to conclude that the apparent improvement in these cases was necessarily due to the operation, yet it may have been.

Thirteen cases, or 59 per cent., were "unimproved." Six of these, or 30 per cent., died soon after operation and were classed as operative deaths. All of the post-operative deaths occurred within eleven days of operation. The remaining seven showed a progressive course uninfluenced by operation, with continued ascites, indigestion, weakness and loss in weight, and died from three weeks to six months later. Autopsies were obtained on only two patients. The cause of death was difficult to determine in most cases but was apparently as follows: hepatic insufficiency, three cases; thrombosis of the superior mesenteric vein, one case; and cardio-renal failure, two cases.

Only four of the twenty-two cases in this series received any specialized medical treatment. One "unimproved" case was given ammonium chloride and novasurol for three weeks after operation without noticeable effect. One "improved" case with a positive blood Wassermann received nine injections of bismuth. It was felt, however, that the cirrhosis was not luetic but of the

ANALYSIS OF TWENTY-THREE CASES OF PORTAL CIRRHOSIS WITH ASCITES

Unit No.	Sex	Age	Duration of Symptoms before Op.	Duration of Ascites before Op.	Type of Onset	Times Tapped before Op.	Average Amount in liters	Alcohol	Blood Wass.	Jaundice	Operation	Pathology	Course	Times Tapped After Op.	Length of Follow-Up
20229	M.	63	11 mos.	1 mo.	Abdominal Swelling	33	-	+++	?	0	10/2/14 Omentopexy	Hard granular liver.	Died 4/7/15. Decreased formation of ascites after op.	2	6 mos.
20232	F.	35	3 mos.	3 mos.	Swelling	8	8	0	Neg.	0	10/29/14 Omentopexy	Enlarged granular liver.	10/3/15, sick and weak. Only slight relief from ascites. Life perhaps prolonged.	0	1 Yr.
21477	F.	19	6 mos.	6 mos.	Swelling	3	?	0	Neg.	+	1/27/15 Omentopexy	Small cirrhotic liver. Spleen large.	Died 18 days post-op.-cholemia and renal failure. Autopsy - atrophic cirrhosis.	1	18 days
23435	M.	39	1 yr.	1 yr.	Swelling	4	9	++++	Neg.	0	11/12/15 Omentopexy	Large rough cirrhotic liver.	Lost - No follow-up.	2	None
30362	F.	68	2 weeks	2 weeks	Swelling	2	9	++	Neg.	0	1/31/16 Omentopexy	Liver not described.	Died 4/14/16. Progressive course.	2	2½ mos.
30448	M.	50	3 weeks	3 weeks	Swelling	3	6	++++	Neg.	0	2/18/16 Omentopexy	Small nodular liver.	Died 10 days post-op. Autopsy - Large nodular liver and thrombosis of superior mesenteric vein.	1	10 days
30990	M.	52	2 yrs.	2 yrs.	Swelling	2	12	+++	Neg.	0	9/28/16 Omentopexy	Hard nodular liver.	Died 10/17/18. Ascites not relieved but life possibly prolonged.	7	2½ yrs.
33002	M.	33	1 yr.	1 yr.	Swelling	2	?	++++	Neg.	0	10/31/16 Omentopexy	Liver obscured by vascular adhesions.	Tapped 7/26/17. No accumulation after 1/18/18. 11/28/33, no ascites or indigestion.	1	17 yrs.
33740	F.	12	2 weeks	2 weeks	Swelling	2	3	0	Neg.	0	2/3/17 Omentopexy	Atrophic hard nodular liver.	Died 4 days post-op. Autopsy - probably hepatic insufficiency.	0	4 days
33881	M.	48	5 mos.	5 weeks	Loss of weight.	4	8	++++	Neg.	0	2/23/17 Omentopexy	Typical hobnail liver, vessels engorged.	Died in spring 1917. Progressive course.	6	3 mos.
48644	M.	33	6 mos.	6 mos.	Swelling	7	8	++	Neg.	+	1/21/21 Omentopexy	Large liver & spleen. Dilated veins in round ligament, liver and spleen-Microscopic section-portal cirrhosis.	No fluid after 10/17/22. Working without symptoms 1922-31. Died 12/31/31 following return of ascites for 6 months.	10	10½ yrs.
49146	M.	52	1 yr.	1½ mos.	Indigestion	0	0	?	?	0	2/19/21 Omentopexy	Small contracted nodular liver.	Died. 3 days post-op. cardio-renal failure	0	3 days
50031	M.	50	3 mos.	3 mos.	Swelling	1	5	?	Neg.	+	5/11/21 Omentopexy	Small hobnail liver. Large omental veins. Micr. section - portal cirrhosis.	Died 4th day post-op. cardiac failure.	0	4 days
51988	M.	52	1 mo.	1 mo.	Swelling	4	5	++	Neg.	0	12/29/21 Omentopexy	Atrophic nodular liver.	Died 5/6/22. Progressive course.	9	5 mos.
58837	M.	47	5 mos.	5 mos.	Indigestion	6	5	Rare	Neg.	0	2/16/24 Omentopexy	Cirrhotic hobnail liver.	Died 10 days post-op. Cause undetermined.	0	10 days
69567	M.	60	5 weeks	5 weeks	Indigestion	1	4	++++	++++	+	8/31/27 Omentopexy	Hard small granular liver. Some adhesions. Spleen large.	Died 6/25/29. Reaccumulation of fluid & jaundice just before death. Perhaps temporary benefit from op.	10	1-5/6 yrs
69840	M.	45	5 mos.	5 mos.	Swelling	2	?	0	Neg.	0	9/27/27 Omentopexy	Liver very small and cirrhotic. Spleen large	Apparently progressive course. Last follow-up 3/19/28. Died some yr.	6	16 mos.
71481	F.	41	2 mos.	1 week	Jaundice	1	6	Rare	Neg.	++	6/8/28 Omentopexy	Very small nodular liver. Enlarged vessels in omentum	Died 8 hours post-op. "Shock"	0	12 hrs.
79122	M.	37	3 weeks	2 weeks	Swelling	1	3	+++	Neg.	0	2/16/29 Omentopexy	Liver small and hob-nailed. Enlarged vessels in round ligament.	Symptom free on last follow-up visit. 4/25/34	2	5 yrs.
84683	M.	51	5 mos.	5 mos.	Swelling	0	0	0	Neg.	0	7/31/29 Omentopexy	Large granular liver. Large spleen. Microscopic specimen of liver-portal cirrhosis.	Died 9/10/29. Developed post-operative lung abscess.	1	1½ mos.
85440	F.	20	3 yrs.	3 yrs.	Dyspnea	28	8	0	-	0	12/31/29 Omentopexy	Large hard granular liver & spleen. Microscopic section - cirrhosis.	Died 3/-/31 of "pneumonia". Perhaps some improvement.	2	1¼ yrs.
254177	F.	58	7 weeks	7 weeks	Swelling	3	?	0	Neg.	0	5/23/30 Omentopexy	Granular cirrhotic liver. Spleen enlarged. Microscopic liver specimen - atrophic cirrhosis.	Died 10/9/30. Progressive course. Developed tuberculous pleurisy.	5	5 mos.
83762	F.	30	3½ yrs.	3½ yrs.	Hematemesis	0	-	0	+++	0	2/27/31 Omentopexy	Small nodular liver. Spleen large, large collateral circulation.	Symptom free until sudden death from hematemesis 2/5/34.	0	3 yrs.

usual portal type, because of the history of excessive use of alcohol and the typical hobnail liver found at operation. One "symptom-free" case was treated with ammonium nitrate and novasurol for a few days after operation; and another with a positive blood Wassermann received a few injections of neoarsphenamine without changing the blood reaction. The liver was of the typical Laennec type.

Comment.—Although the number of cases is too small to give conclusions much weight, certain observations which were made seem of some significance. The two cases which have remained free of symptoms up to the present time showed evidence at operation of a collateral portal circulation. This was also true of two "improved" cases; one that remained in good health for ten years after operation before a final relapse, and one that lived in good health for three years before a fatal œsophageal hemorrhage. These four cases had already begun to do for themselves what it was hoped the operation would do for them. This finding seems to be of real prognostic value. Because of the possibility that some collateral circulation may be present in the anterior abdominal wall at the time of operation, a vertical split rectus muscle incision seems preferable to a transverse one which might impair these vessels.

The average age of the two cases that have remained symptom-free since operation and the "improved" case that survived ten years was nine years less than that for the whole group, and fifteen years under that of the "unimproved" group. Perhaps younger individuals can tolerate liver poisons better, can regenerate liver tissue more readily or can compensate for the portal obstruction by developing a collateral circulation more rapidly or to a greater extent.

The cases that did best averaged a longer duration of ascites before operation than the others. Thus the "symptom-free" and "improved" cases combined averaged ten months' duration of ascites whereas the "unimproved" averaged only one and two-thirds months. This should probably not be interpreted as an argument against early operation, but rather that cases with rapid decompensation of the liver and rapid formation of ascites did badly, whereas those with more gradual decompensation responded better to operative treatment. Eliot and Colp,[12] whose series of cases published in 1919 include some of those reported here, emphasize also that the slower the effusion into the peritoneal cavity before operation, the better the prognosis after it. It would seem as if liver damage in the acute cases was too extensive or occurred too rapidly to give time for liver regeneration or for the development of a collateral circulation.

No inference could be drawn in this series from the relation of the size of the liver to prognosis. Tempsky,[6] Bricher,[7] and Greenough[8] believe that cases with enlarged liver represent an earlier stage of the disease and do better following operation than the atrophic cases, but others disagree with this view. From their studies on experimental cirrhosis, Bollman and Mann[13] believe that the size of the liver depends on the relative degree of atrophy

and compensatory hypertrophy that has occurred rather than on a stage in the disease.

The 26 per cent. operative mortality in this series is similar to results published by others. Notzel[14] states that the usual figures range from 20 to 30 per cent. Turner[15] had 31 per cent. operative deaths in a small series of sixteen cases. Tempsky[6] had 20 per cent. in twenty-five cases. Mayo[5] reported only 15 per cent. in a series of forty-seven cases. With more careful selection of cases and better ante-operative and post-operative care, the mortality should be much less. Cases with advanced cardiac and renal disease should be excluded. Local anesthesia is to be preferred. Avertin should be avoided. A high carbohydrate diet before operation and the use of glucose subcutaneously and intravenously after operation should help to maintain the glycogen reserve of the liver and to minimize liver damage.

The habitual use of alcohol in 43 per cent. of cases agrees with the reports of other writers. In a recent review of statistics from Europe and North America, Fiessinger[16] finds it held responsible in 46–60 per cent. of cases.

The occurrence of hematemesis in only one case in this group is surprising. Rowntree[17] has recently stated that the three chief dangers confronting a patient with portal cirrhosis were ascites, hepatic insufficiency, and hemorrhage. Of these he believed hemorrhage to be the greatest. McIndoe[18] of The Mayo Clinic recently reported that "there was a fatal gastro-intestinal hemorrhage in thirteen (50 per cent.) of the last twenty-six patients who died of advanced portal cirrhosis." In nearly all of these cases the bleeding occurred from varices at the lower end of the œsophagus or just within the cardia. He[19] describes these as follows: "The varices, which develop here with unfailing regularity, lie between the coronary vein of the portal circulation on the one hand, and the inter-costal and azygos minor veins of the caval system on the other. The coronary vein normally drains the lesser curvature of the stomach from pylorus to cardia, and then turns abruptly to the right within the gastrohepatic omentum to open into the portal vein proximal to its juncture with the splenic vein. Coincident with the development of the collateral circulation the flow of blood in this vein is reversed and the full force of the portal current is directed against the cardia and œsophageal anastomotic venous plexus and a localized area of submucosal varicose veins is produced, which owing to its unprotected situation is particularly exposed to trauma." At the suggestion of Rowntree and McIndoe in 1929 Walters[20] was the first to try ligation of the coronary vein in a patient with portal cirrhosis and recurrent hematemesis. The gastro-hepatic omentum was also divided and the ends sutured into the abdominal incision. A similar procedure has been used in several subsequent cases. Commenting on the operation McIndoe[19] states that "it offers the advantage of increasing the available anastomotic pathways (the sole object of the Talma-Morison operation) and at the same time protects the patient against recurrence of gastro-intestinal hemorrhage. Whether the direct reduction in the amount of blood coming to the œsophageal varices will be sufficient to prevent hemorrhage

from them remains to be seen. It is significant that in Banti's disease hematemesis is to a large extent controlled by removal of the spleen, which reduces the portal blood flow by at least 20 per cent. This would suggest that the incidence of hemorrhage is particularly susceptible to reduction in the vis-a-tergo producing the œsophageal varices." Kegaries[21, 22] has recently studied the submucous plexus of the cardia and the œsophagus by injection experiments. He calls attention to the anastomosis between the splenic and œsophageal veins through the vasa brevia and the advisability of ligating these veins as well. As a result of his work, Walters[23] advocates omentopexy using the gastro-colic omentum and ligation of both the coronary vein and the vasa brevia. He advises splenectomy later if the bleeding persists and if the patient's condition warrants it. If splenectomy is impossible because of extensive adhesions about the spleen ligation of the splenic artery to produce atrophy of the spleen and lessen the danger of hematemesis might be considered. This procedure has been advocated by Haberer[24] and others[25, 26, 27, 28] but has not been tried in enough cases to determine its safety or its value. It carries with it the risk of causing necrosis of the spleen. Haberer believes this danger may be avoided by ligating the splenic artery proximal to the point near the hilum where the short gastric arteries enter the spleen and anastomose with the splenic artery.

The results in the series reported are not very encouraging. Fourteen out of twenty-two cases died within six months of operation and nineteen died within two and one-half years. Yet two cases, or nine per cent., are living and well seventeen and five years respectively following operation, and one case was well for ten years after operation before a final relapse. Omentopexy seems to have proved of definite value in these cases and perhaps in several others. As McIndoe has pointed out, the criticism of omentopexy as a means of increasing collateral circulation is that the new pathways may never form, may be inadequate, or the time needed for their production may be too long for the patient to obtain any benefit from them. The operation has definite limitations and is essentially a palliative one. Schiassi[29] believes it to be most beneficial in early cirrhosis of alcoholic origin before liver damage has become extensive and before the general condition of the patient has been lowered to the point where operation is hazardous. It seems probable that operation has not been done early enough. Rowntree believes that it should be done before the development of liver decompensation and ascites. Recently Chapman, Snell, and Rowntree,[30, 31] have reported a series of 112 cases of cirrhosis with ascites studied at The Mayo Clinic for six years. Eighty-four of these were placed on a high carbohydrate dietary régime with restriction of fluids, meats, and meat extractives, and were treated with various diuretics such as ammonium chloride, novasurol, salyrgan and metaphyllin. Fifty per cent. of these showed disappearance of edema and ascites and marked relief from indigestion and abdominal distress. Twenty-eight of these patients, or 25 per cent., were still living at an average of thirty-eight months following appearance of

ascites, which is longer than the two to six months expectancy given by previous authors. These results are decidedly encouraging. More recently these authors[31] have studied earlier cases of cirrhosis in the compensated or pre-ascitic stage. They report thirty-three patients, or 57 per cent., living at an average of almost eight years after the onset of their symptoms. They emphasize the far better prognosis in these earlier cases and their quicker response to both conservative and operative treatments. Elimination of alcohol and other substances injurious to the liver will frequently restore health and prevent further liver degeneration. Surgical procedures are well tolerated. They suggest that a history of hematemesis in these cases or the presence of a collateral venous circulation may well justify an omentopexy with perhaps ligation of the œsophageal veins. We have one case, not included in this series because of the absence of ascites, on whom omentopexy was done for recurrent hematemesis in what was probably the preascitic stage.

CASE.—B. H., a young woman, aged twenty-eight, entered the hospital January 22, 1923, complaining of dull epigastric pain, nausea, vomiting, and jaundice for ten days. She had had a severe cold for the preceding two weeks. There was no history of previous jaundice, indigestion or alcoholism. Examination showed a well-nourished girl, acutely ill, moderately prostrated, and definitely jaundiced. There was tenderness and slight spasm in the right upper quadrant of the abdomen. The temperature and blood count were normal. The blood Wassermann was negative. The prostration, vomiting and jaundice continued for many weeks. The liver, which was not palpable at first, became enlarged, tender and painful. Loss of appetite and mental depression were marked. She was thought to have an acute toxic hepatitis or possibly a recurrent cholangitis with chronic pancreatitis. She improved slowly, however, in spite of frequent recurrence of her symptoms and was finally discharged after three months in the hospital.

The second admission was January 16, 1924, because of a return of upper abdominal pain and vomiting. An exploratory operation with cholecystostomy was done. The liver was found deformed by bands of connective tissue between which normal-appearing liver tissue protruded. A specimen of the liver removed for pathologic examination showed "acute yellow atrophy." The gall-bladder was slightly thickened but contained no stones. The bile ducts and pancreas were normal. She remained in the hospital for six months and continued to have repeated attacks of pain and vomiting, interpreted as evidence of hepatic poisoning.

The third admission was December 21, 1927, after a three-year interval free from severe attacks. She had had, however, mild upper abdominal pain and occasional vomiting. This admission was due to the sudden vomiting of blood. She improved after a rest and one transfusion, and was discharged three weeks later.

Three months later, September 19, 1928, she was admitted for the fourth time in a critical condition because of severe hematemesis. Repeated transfusions and fluid intravenously and subcutaneously were necessary. The guaiac test for blood in the stools was positive for three weeks.

Because of the repeated bleeding presumably from œsophageal varices, omentopexy was thought to be indicated and she was admitted for the fifth time March 27, 1929. At operation a scarred liver studded with islands of regenerated liver tissue was again found. The vessels in the mesentery and round ligament were moderately engorged. The omentum was sutured between the rectus muscle and the posterior sheath. After the operation the patient regained health rapidly and has remained well ever since. When last seen four and one-half years later she was working regularly, was free from

pain or digestive symptoms, and had had no further bleeding. This dramatic improvement followed omentopexy and may well have been due to it.

It seems probable that omentopexy will prove of greater value if done earlier before liver injury has become severe and if done even before ascites has developed in cases with hematemesis or evidence of established collateral circulation. Earlier operation and better ante- and post-operative care should lower the present high mortality. Operation should prove more effective if supplemented by a proper dietary régime and by diuretics in suitable cases. If accompanied by ligation of the coronary vein and vasa brevia and possibly in certain cases by splenectomy, which reduces the flow of blood through the portal vein by over 20 per cent., the danger of hemorrhage may be lessened.

CONCLUSIONS

(1) Twenty-three cases of portal cirrhosis of the liver with ascites on whom omentopexy had been performed have been studied. Follow-up results were obtained in twenty-two cases.

(2) Two cases, or 9 per cent., were classed as "symptom-free"; seven cases, or 32 per cent., as "improved"; and thirteen cases, or 59 per cent., as "unimproved."

(3) The average age of the "symptom-free" group was nine years less than that of the whole group and fifteen years under that of the "unimproved" group.

(4) Both "symptom-free" cases, and two "improved" cases, one relieved of symptoms for ten years before a final relapse, and another, well for three years before a terminal hemorrhage, showed evidence at operation of an established collateral circulation.

(5) The operative mortality was 27 per cent.

(6) It would seem as if omentopexy was of some value in the treatment of portal cirrhosis with ascites.

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ACUTE CHOLECYSTITIS*

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The majority of surgeons and most internists until recent years have counseled a period of waiting before resorting to surgical intervention in acute cholecystitis, in the belief that the final results are better and the mortality less, if the operation is done when the infection has quieted down. Many still adhere to the latter dictum. A number of reports have appeared within the past few years that seem to challenge clearly the widely accepted precept of delaying surgery in the treatment of acute cholecystitis. So much so that some surgeons now regard acute cholecystitis as an acute surgical emergency, notably Kirschner, Petren,[1] the Lyon School of Surgery headed by Leriche and Cotte, Heuer,[2] Finney,[3] Stone and Owings,[4] Lund,[5] and others.

The contributions of H. F. Graham,[6] and Max H. Zinninger[7] present strong evidence in favor of early surgery as the most effective and satisfactory means for the treatment of acute cholecystitis. The present study is based on a series of some twenty consecutive operative cases of acute cholecystitis, the majority of whom were subjected to surgery within a short time after admission to the hospital. Admittedly the total number of patients is relatively small, and has no statistical value but the splendid clinical results and the absence of any mortality support the tenet of early surgery in the treatment of acute cholecystitis.

The connotation of an emergency operation in instances of acute cholecystitis is not to be interpreted in the same manner as in cases of perforation of an ulcer or an acute appendicitis. Time is usually taken to make a careful clinical survey of the patient by the internist, the common laboratory examinations, and to carry out such preoperative measures as appear necessary. In a few cases the operation has been done in the early hours of the morning, because any delay in resorting to surgery seemed unwise. As in surgery elsewhere there is no substitute for surgical judgment. The interval between the time of admission of the patient and the operation ranged from three to 24 hours, and in a few instances a waiting period of 48 hours was advisable, in order to better prepare the patient for the operation. More than half of the cases were subjected to surgery within 12 hours after admission to the hospital.

Case Reports

Case I.—H. L., male, aged 49. Admitted Feb. 4, 1933, discharged Feb. 18, 1933. The patient was well until six weeks before admission, and gave a history of nocturnal pain unrelieved by food or alkalies. At 2 A.M. of day of admission patient developed severe pain over right upper quadrant of the abdomen, which was not relieved by

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morphine. Temperature on admission 101° F., W.B.C. 16,400, polys, 73 per cent. Definite local tenderness over gallbladder area. He was watched for about eight hours, given two ampules of glucose intravenously and eight hours following admission was operated upon under nitrous oxide-ether anesthesia. A gangrenous gallbladder and appendix were removed. Convalescence uneventful. Wound healed well and patient was discharged 14 days after admission. Microscopic report; gallbladder showed entire gangrene of mucosa, with marked thickening and necrosis of the periserosal tissues.

CASE II.—M. K., male, aged 33. Admitted Nov. 23, 1932, discharged Dec. 8, 1932. History of recurrent attacks of pain, over right upper quadrant, requiring morphine on several occasions. Temperature on admission 100° F. Physical examination showed tenderness and rigidity over the gallbladder area. Blood count, W.B.C. 23,500, 90 per cent polys, urine negative. The patient was watched 36 hours, and the elevated temperature and pain persisted. Operation Nov. 25, 1932, under spinal anesthesia supplemented by ether and nitrous oxide. A distended inflamed gallbladder was found, showing areas of necrosis. The gallbladder was removed. The temperature dropped to normal on the second day postoperative and he made an uneventful recovery. Discharged 13 days after operation. Microscopic report; scarcely any normal tissue recognizable. The mucosa is entirely gangrenous. Periserosal tissue is gangrenous in spots.

CASE III.—K. B., female, aged 50. Admitted Dec. 17, 1932, with signs of an acute gallbladder. Temperature 102° F., pulse 120, blood count, W.B.C. 16,150, polys 77 per cent. Blood chemistry and Wassermann normal. Urine showed few hyaline casts, and many white cells. A cystoscopy was done, because of the urinary findings, but proved negative. Operation December 18, 1932, under local anesthesia. A large, beefy, congested gallbladder, surrounded by purulent exudate and filled with stones, was removed. Temperature dropped to normal within 48 hours and patient was discharged Jan. 1, 1932. Microscopic diagnosis; acute suppurative cholecystitis with areas of gangrene and intramural abscess formation.

CASE IV.—S. T., male, aged 49. Admitted Aug. 7, 1933. Patient was ill at home two days with typical symptoms of acute gallbladder disease. During the past year he had a number of attacks of biliary colic. Blood count 28,000, polys 92 per cent. Urine showed albumin and fine granular casts. Blood chemistry and Wassermann negative. Patient was excessively obese. He was operated upon the day following admission, being prepared by large amounts of glucose. An acute gangrenous gallbladder was removed. Patient discharged 11 days postoperatively. Microscopic diagnosis; gangrenous cholecystitis.

Comment.—These four cases serve as excellent examples of the splendid results from early operation.

CASE V.—R. H., female, aged 50. Admitted Dec. 2, 1932, discharged Jan. 16, 1933. Patient was admitted to the hospital with a diagnosis of acute gallbladder disease and was kept on the medical service with the idea of operation after the acute symptoms had subsided. These were of three days' duration before her transfer to the hospital. Clinically the diagnosis was clear cut. On admission her temperature was 100° F., W.B.C. 11,200, polys 79 per cent, blood chemistry and Wassermann normal. Icteric index, 5.1. Her condition after fluctuating for two or three days grew much worse, temperature rose to 104° F. with marked aggravation of the local signs. Operation was done eight days after admission. A large, distended, gangrenous gallbladder filled with calculi was removed. Discharged Jan. 16, 1933. Microscopic diagnosis; gangrenous cholecystitis.

Comment.—This case illustrates the hazards of delay. The symptoms on admission were seemingly mild. She showed improvement for two or three days, and then a flare-up took place, her condition continued to fluctuate, and she was transferred to the surgical service seven days after admission. This

patient's stay in the hospital was 39 days, her convalescence being complicated by wound infection, and low grade pulmonary infection. The convalescence was much stormier than is observed with the usual prompt operation.

CASE VI.—C. B., male, aged 65. Patient admitted to the hospital with a clinical picture which was not clear. Eighteen years ago he had a gastro-enterostomy done for duodenal ulcer. Temperature 101° F., W.B.C., 12,800, polys 86 per cent. During the night he developed violent upper abdominal pain and a possible perforation of an ulcer was suspected. Immediate operation. An acutely inflamed gallbladder filled with calculi was removed. Convalescence uneventful, discharged 14 days postoperatively.

CASE VII.—S. S., female, aged 57. Patient admitted with symptoms and signs of an acute gallbladder. She was an asthmatic of many years, and preoperatively showed pulmonary atelectasis of right lung. Blood count, 19,700 W.B.C. 92 per cent polys, blood chemistry normal. She was operated on 12 hours after admission, and an acutely gangrenous gallbladder filled with stones was removed. She was discharged 14 days postoperatively.

Comments.—These two cases serve to illustrate the value of early surgical attack, even in bad risk patients.

CASE VIII.—C. B., male, aged 71. Admitted May 24, 1930; discharged June 4, 1930. The patient gave a history of many years' standing of frequent gallbladder colics, necessitating morphine. On day before admission recurrent attack was accompanied by chills and vomiting, with temperature 100° F., blood count 12,000 W.B.C., 85 per cent polys, urine negative. Physical examination showed marked tenderness and rigidity over the right hypochondrium where a mass could be felt. There was also marked tenderness and rigidity over the appendiceal area. Because of the latter findings a diagnosis of acute appendicitis was made, although it was felt that the gallbladder was also involved. It was decided to proceed with immediate operation. Operation May 24, 1930 under local anesthesia. McBurney incision was used to remove an appendix which showed only chronic inflammatory changes. A right rectus incision was now made and a large, inflamed distended gallbladder filled with innumerable small black calculi exposed. Because of the patient's poor condition cholecystostomy alone was done. Postoperative course was uneventful. Patient received one transfusion five days after the operation. He was discharged June 4, 1930, 11 days postoperatively.

Comment.—This case illustrates that prompt operation even in the old with generally unsatisfactory condition is not necessarily highly dangerous.

CASE IX.—C. M., female, aged 39. Admitted June 15, 1930 complaining of pain in abdomen of one week's duration. On admission temperature 101° F., W.B.C. 14,000, 90 per cent polys, blood chemistry and Wassermann normal, icteric index 8.6. Physical examination showed an obese female, conjunctivae slightly icteroid. There was distention of the abdomen, and a palpable mass, exquisitely tender over the gallbladder area. The patient was prepared for two days with glucose intravenously and normal salt solution by hypodermoclysis. Operation June 17, 1930 under spinal anesthesia. A large inflamed gallbladder containing many calculi was removed. Convalescence smooth, patient discharged June 30, 1930. Microscopic diagnosis; acute cholecystitis.

Comment.—The delay of two days was due to the patient's reluctance to submit to immediate surgery. The time was utilized to prepare her for the operation by appropriate measures.

CASE X.—I. R., male, aged 54. Admitted Feb. 27, 1933 complaining of severe pain of three days' duration in the right upper quadrant. He gave a history of preceding biliary

attacks. Temperature 101° F. Urine showed sugar 1 per cent, acetone 4 and diacetic acid plus. Blood count, W.B.C. 18,900, polys 90 per cent. He appeared very toxic. Heart and lungs negative. The local abdominal findings were typical of an acute gallbladder. Operation on day of admission under spinal anesthesia, supplemented by nitrous oxide and oxygen. A large distended gangrenous gallbladder filled with stones was removed. No stones palpated in common duct. His temperature remained elevated for three days after operation, and then dropped to normal. Discharged 13 days postoperatively. Patient was treated for his diabetes by proper diet and insulin. Microscopic diagnosis; gangrenous cholecystitis.

Comment.—This case illustrates the value of prompt operation, even in presence of known diabetes.

Only those cases are included in which the clinical diagnosis of acute cholecystitis could be reasonably established without difficulty. Excluded from this group are: (1) Patients in whom the diagnosis of acute cholecystitis is uncertain; (2) patients presenting clinical evidence of common duct pathology. Calculous obstruction of the common duct is usually associated with a shrunken gallbladder and pursues a clinical course essentially different from an acute cholecystitis; for in the latter the lesion is essentially in the gallbladder.

The clinical differentiation between acute cholecystitis and an uncomplicated biliary colic is at times not easy. Acute biliary colic is usually accompanied by but little elevation of temperature; often the latter is normal, and in the absence of complications the attack subsides completely within a few hours. Such cases are for the time being treated conservatively, since aside from the acute pain they show no clinical signs of an acute inflammation or obstruction of the gallbladder. Fortunately the incidence of colic episodes far outnumbers the incidence of acute cholecystitis.

If the biliary colic is associated with tenderness in the right upper quadrant, increased muscle resistance, and often a definite mass in the region of the gallbladder, an everted palpable edge of the liver, elevation of temperature and a leukocytosis, with high percentage of polynuclears, the case is designated as an acute cholecystitis. Obviously there is great variation in the clinical picture of this lesion. One encounters on the one hand, violent cases of acute cholecystitis, beginning suddenly with local symptoms so severe that large doses of morphine are useless in relieving their pain. They are a problem of treatment both to the internist and to the surgeon. And at the other extreme are the patients in the later decades of life. In many patients beyond the age of fifty, not only acute cholecystitis, but other grave abdominal lesions, may masquerade under the guise of innocent and mild symptoms.[8] Most of the cases included in this survey exhibited a definite, clear-cut clinical picture of acute cholecystitis.

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immediate surgery; the other types of acute cholecystitis, namely, acute exacerbations of chronic cholecystitis, acute hydrops, acute empyema, necrotic edema, acute phlegmonous cholecystitis, are frequently treated conservatively until the acute symptoms have subsided. In many cases it is not possible to tell when the perforation has taken place. Perforation of an acute gallbladder, particularly in the old, may occur so insidiously as to pass unrecognized. By far the majority of perforations occur in patients more than fifty years of age. In fact the state of affairs closely resembles acute obstructive appendicitis, but there is this difference, when perforation of the gallbladder does occur there is much greater likelihood for it to be localized. Gangrene and perforation are more common in the old than in the young, in patients, as Heuer states, in whom it may be more advisable to wait. Mentzer[9] records four unrecognized perforations of the gallbladder on the medical service with a mortality of 100 per cent. Three times perforations of the gallbladder have been found at postmortem, which were not recognized clinically.

Heuer[2] in a series of 74 cases of acute cholecystitis, notes that 18 (25 per cent) were gangrenous or had perforated, and three of the 18 became gangrenous or had perforated while waiting for the symptoms to subside. Twenty-four of remaining 56 cases which were not subjected to immediate surgery failed to subside after waiting and required operation during the acute stage. The mortality in acute cases without gangrene or perforation was five per cent, and with perforation or gangrene 16 per cent. Thus the mortality of operation performed early in the acute stage, before gangrene or perforation has occurred, is not higher than the mortality of interval operations.

Judd and Phillips[10] note that they encountered seven cases presenting general abdominal infection in their reported series of 508 cases of cholecystitis. In none of the seven were they able to recognize symptoms that would suggest disease of the gallbladder and it was not suspected that rupture of the gallbladder was the cause of the trouble until this was revealed at necropsy. It is interesting to note that the first two patients in the present series were operated upon as emergency cases with the diagnosis of acute intestinal obstruction, because of acute abdominal distention and paresis, probably the result of secondary peritonitis. In each instance an acute cholecystitis was found as the cause, and the recovery of both these patients was smooth and uneventful. It was this fortunate initial experience that led to the adoption of early surgical attack in patients presenting the clinical picture of acute cholecystitis.

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almost invariably leads to cholecystitis, whereas ligation of the common duct does not as a rule.

The problem of infection and its relation to cholecystitis is difficult of assessment. Infection is perhaps a secondary factor in the pathologic condition that exists in most instances. Acute cholecystitis apparently develops only on the soil of a previously diseased gallbladder.

Cultural studies of cases of chronic and subacute cholecystitis seem to support the opinion that they are not always the result of infection. Acute cholecystitis, on the other hand, yields a much higher percentage of positive bacteriologic findings. Gordon-Taylor and Whitby[11] by means of improved bacteriologic technic, made a careful bacteriologic study of 50 consecutive cases of cholecystectomies; included in the latter were ten instances of frankly acute cholecystitis. *B. welchii* was present in five of these (three in pure culture); four showed *Bacillus coli*, and one *Bacillus coli* and *Streptococcus viridans*. This study would appear to indicate that frankly acute cholecystitis is in almost every instance precipitated by bacterial invasion either in wall of the gallbladder, the bile, calculi or in all three. Apropos of the relation of *B. welchii* to cholecystitis, it is not without interest that there are on record a number of typical violent *B. welchii* infections of the gallbladder. Brütt[12] in 1923, in a series of 130 cases of biliary tract disease, found two acute necrotic gas bacilli infections. *Bacillus coli* were also isolated in these two cases in addition to the Welch bacillus. Additional cases are reported by Kirshmayer,[31] J. Simon,[14] Koch[15] and Halle and Marquezy[16]. The latter's case is reported under the title, "Cholecystitis Gangrenosa Perforata." Clinically these patients presented no evidence enabling one to differentiate them from the usually observed acute cholecystitis. And in all of them with the exception of the one reported by Halle and Marquezy, the infection was associated with the presence of calculi in the gallbladder.

The case reported by Gunther[17] is especially interesting. Cholecystostomy was performed on a patient with acute pancreatitis, and a pure culture of *B. welchii* was obtained from the gallbladder bile. D. B. Phemister[18] operated upon a patient who had a combination of acute pancreatitis and gangrenous cholecystitis in whom cultures from the bacterial exudate revealed *B. welchii* in pure culture.

Andrews[19] notes that the finding of bacteria was about twice as common in the acute (59 per cent) as in the common cases (28 per cent). Furthermore he notes that if the cystic duct is closed the acute cases gave positive bacterial growth in eight of 11 cases; but in the chronic group it was sterile in nine out of ten cases. Andrews bacterial findings indict the *B. coli* as the organism associated with most of his postoperative disasters: It was found in nine cases, in three the patients died; a fourth patient developed a large post-

pain or digestive symptoms, and had had no further bleeding. This dramatic improvement followed omentopexy and may well have been due to it.

It seems probable that omentopexy will prove of greater value if done earlier before liver injury has become severe and if done even before ascites has developed in cases with hematemesis or evidence of established collateral circulation. Earlier operation and better ante- and post-operative care should lower the present high mortality. Operation should prove more effective if supplemented by a proper dietary régime and by diuretics in suitable cases. If accompanied by ligation of the coronary vein and vasa brevia and possibly in certain cases by splenectomy, which reduces the flow of blood through the portal vein by over 20 per cent., the danger of hemorrhage may be lessened.

CONCLUSIONS

(1) Twenty-three cases of portal cirrhosis of the liver with ascites on whom omentopexy had been performed have been studied. Follow-up results were obtained in twenty-two cases.

(2) Two cases, or 9 per cent., were classed as "symptom-free"; seven cases, or 32 per cent., as "improved"; and thirteen cases, or 59 per cent., as "unimproved."

(3) The average age of the "symptom-free" group was nine years less than that of the whole group and fifteen years under that of the "unimproved" group.

(4) Both "symptom-free" cases, and two "improved" cases, one relieved of symptoms for ten years before a final relapse, and another, well for three years before a terminal hemorrhage, showed evidence at operation of an established collateral circulation.

(5) The operative mortality was 27 per cent.

(6) It would seem as if omentopexy was of some value in the treatment of portal cirrhosis with ascites.

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ACUTE CHOLECYSTITIS*

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The majority of surgeons and most internists until recent years have counseled a period of waiting before resorting to surgical intervention in acute cholecystitis, in the belief that the final results are better and the mortality less, if the operation is done when the infection has quieted down. Many still adhere to the latter dictum. A number of reports have appeared within the past few years that seem to challenge clearly the widely accepted precept of delaying surgery in the treatment of acute cholecystitis. So much so that some surgeons now regard acute cholecystitis as an acute surgical emergency, notably Kirschner, Petren,[1] the Lyon School of Surgery headed by Leriche and Cotte, Heuer,[2] Finney,[3] Stone and Owings,[4] Lund,[5] and others.

The contributions of H. F. Graham,[6] and Max H. Zinninger[7] present strong evidence in favor of early surgery as the most effective and satisfactory means for the treatment of acute cholecystitis. The present study is based on a series of some twenty consecutive operative cases of acute cholecystitis, the majority of whom were subjected to surgery within a short time after admission to the hospital. Admittedly the total number of patients is relatively small, and has no statistical value but the splendid clinical results and the absence of any mortality support the tenet of early surgery in the treatment of acute cholecystitis.

The connotation of an emergency operation in instances of acute cholecystitis is not to be interpreted in the same manner as in cases of perforation of an ulcer or an acute appendicitis. Time is usually taken to make a careful clinical survey of the patient by the internist, the common laboratory examinations, and to carry out such preoperative measures as appear necessary. In a few cases the operation has been done in the early hours of the morning, because any delay in resorting to surgery seemed unwise. As in surgery elsewhere there is no substitute for surgical judgment. The interval between the time of admission of the patient and the operation ranged from three to 24 hours, and in a few instances a waiting period of 48 hours was advisable, in order to better prepare the patient for the operation. More than half of the cases were subjected to surgery within 12 hours after admission to the hospital.

Case Reports

Case I.—H. L., male, aged 49. Admitted Feb. 4, 1933, discharged Feb. 18, 1933. The patient was well until six weeks before admission, and gave a history of nocturnal pain unrelieved by food or alkalies. At 2 A.M. of day of admission patient developed severe pain over right upper quadrant of the abdomen, which was not relieved by

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morphine. Temperature on admission 101° F., W.B.C. 16,400, polys, 73 per cent. Definite local tenderness over gallbladder area. He was watched for about eight hours, given two ampules of glucose intravenously and eight hours following admission was operated upon under nitrous oxide-ether anesthesia. A gangrenous gallbladder and appendix were removed. Convalescence uneventful. Wound healed well and patient was discharged 14 days after admission. Microscopic report; gallbladder showed entire gangrene of mucosa, with marked thickening and necrosis of the periserosal tissues.

CASE II.—M. K., male, aged 33. Admitted Nov. 23, 1932, discharged Dec. 8, 1932. History of recurrent attacks of pain, over right upper quadrant, requiring morphine on several occasions. Temperature on admission 100° F. Physical examination showed tenderness and rigidity over the gallbladder area. Blood count, W.B.C. 23,500, 90 per cent polys, urine negative. The patient was watched 36 hours, and the elevated temperature and pain persisted. Operation Nov. 25, 1932, under spinal anesthesia supplemented by ether and nitrous oxide. A distended inflamed gallbladder was found, showing areas of necrosis. The gallbladder was removed. The temperature dropped to normal on the second day postoperative and he made an uneventful recovery. Discharged 13 days after operation. Microscopic report; scarcely any normal tissue recognizable. The mucosa is entirely gangrenous. Periserosal tissue is gangrenous in spots.

CASE III.—K. B., female, aged 50. Admitted Dec. 17, 1932, with signs of an acute gallbladder. Temperature 102° F., pulse 120, blood count, W.B.C. 16,150, polys 77 per cent. Blood chemistry and Wassermann normal. Urine showed few hyaline casts, and many white cells. A cystoscopy was done, because of the urinary findings, but proved negative. Operation December 18, 1932, under local anesthesia. A large, beefy, congested gallbladder, surrounded by purulent exudate and filled with stones, was removed. Temperature dropped to normal within 48 hours and patient was discharged Jan. 1, 1932. Microscopic diagnosis; acute suppurative cholecystitis with areas of gangrene and intramural abscess formation.

CASE IV.—S. T., male, aged 49. Admitted Aug. 7, 1933. Patient was ill at home two days with typical symptoms of acute gallbladder disease. During the past year he had a number of attacks of biliary colic. Blood count 28,000, polys 92 per cent. Urine showed albumin and fine granular casts. Blood chemistry and Wassermann negative. Patient was excessively obese. He was operated upon the day following admission, being prepared by large amounts of glucose. An acute gangrenous gallbladder was removed. Patient discharged 11 days postoperatively. Microscopic diagnosis; gangrenous cholecystitis.

Comment.—These four cases serve as excellent examples of the splendid results from early operation.

CASE V.—R. H., female, aged 50. Admitted Dec. 2, 1932, discharged Jan. 16, 1933. Patient was admitted to the hospital with a diagnosis of acute gallbladder disease and was kept on the medical service with the idea of operation after the acute symptoms had subsided. These were of three days' duration before her transfer to the hospital. Clinically the diagnosis was clear cut. On admission her temperature was 100° F., W.B.C. 11,200, polys 79 per cent, blood chemistry and Wassermann normal. Icteric index, 5.1. Her condition after fluctuating for two or three days grew much worse, temperature rose to 104° F. with marked aggravation of the local signs. Operation was done eight days after admission. A large, distended, gangrenous gallbladder filled with calculi was removed. Discharged Jan. 16, 1933. Microscopic diagnosis; gangrenous cholecystitis.

Comment.—This case illustrates the hazards of delay. The symptoms on admission were seemingly mild. She showed improvement for two or three days, and then a flare-up took place, her condition continued to fluctuate, and she was transferred to the surgical service seven days after admission. This

patient's stay in the hospital was 39 days, her convalescence being complicated by wound infection, and low grade pulmonary infection. The convalescence was much stormier than is observed with the usual prompt operation.

CASE VI.—C. B., male, aged 65. Patient admitted to the hospital with a clinical picture which was not clear. Eighteen years ago he had a gastro-enterostomy done for duodenal ulcer. Temperature 101° F., W.B.C., 12,800, polys 86 per cent. During the night he developed violent upper abdominal pain and a possible perforation of an ulcer was suspected. Immediate operation. An acutely inflamed gallbladder filled with calculi was removed. Convalescence uneventful, discharged 14 days postoperatively.

CASE VII.—S. S., female, aged 57. Patient admitted with symptoms and signs of an acute gallbladder. She was an asthmatic of many years, and preoperatively showed pulmonary atelectasis of right lung. Blood count, 19,700 W.B.C. 92 per cent polys, blood chemistry normal. She was operated on 12 hours after admission, and an acutely gangrenous gallbladder filled with stones was removed. She was discharged 14 days postoperatively.

Comments.—These two cases serve to illustrate the value of early surgical attack, even in bad risk patients.

CASE VIII.—C. B., male, aged 71. Admitted May 24, 1930; discharged June 4, 1930. The patient gave a history of many years' standing of frequent gallbladder colics, necessitating morphine. On day before admission recurrent attack was accompanied by chills and vomiting, with temperature 100° F., blood count 12,000 W.B.C., 85 per cent polys, urine negative. Physical examination showed marked tenderness and rigidity over the right hypochondrium where a mass could be felt. There was also marked tenderness and rigidity over the appendiceal area. Because of the latter findings a diagnosis of acute appendicitis was made, although it was felt that the gallbladder was also involved. It was decided to proceed with immediate operation. Operation May 24, 1930 under local anesthesia. McBurney incision was used to remove an appendix which showed only chronic inflammatory changes. A right rectus incision was now made and a large, inflamed distended gallbladder filled with innumerable small black calculi exposed. Because of the patient's poor condition cholecystostomy alone was done. Postoperative course was uneventful. Patient received one transfusion five days after the operation. He was discharged June 4, 1930, 11 days postoperatively.

Comment.—This case illustrates that prompt operation even in the old with generally unsatisfactory condition is not necessarily highly dangerous.

CASE IX.—C. M., female, aged 39. Admitted June 15, 1930 complaining of pain in abdomen of one week's duration. On admission temperature 101° F., W.B.C. 14,000, 90 per cent polys, blood chemistry and Wassermann normal, icteric index 8.6. Physical examination showed an obese female, conjunctivae slightly icteroid. There was distention of the abdomen, and a palpable mass, exquisitely tender over the gallbladder area. The patient was prepared for two days with glucose intravenously and normal salt solution by hypodermoclysis. Operation June 17, 1930 under spinal anesthesia. A large inflamed gallbladder containing many calculi was removed. Convalescence smooth, patient discharged June 30, 1930. Microscopic diagnosis; acute cholecystitis.

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When the diagnosis of acute cholecystitis is clear cut, there is usually an obstructing calculus, or calculi in the cystic duct or calculi in the proximal part of the gallbladder. Numerous small calculi are more likely to pass through the cystic duct and enter the common duct. It is the large calculi that are potentially more liable to cause the development of acute cholecystitis. This is especially the case when a stone is impacted in the neck of the gallbladder, the type of lesion which accounts for most of the cases coming under the heading of acute gallbladders. Experimentally, ligation of the cystic duct

almost invariably leads to cholecystitis, whereas ligation of the common duct does not as a rule.

The problem of infection and its relation to cholecystitis is difficult of assessment. Infection is perhaps a secondary factor in the pathologic condition that exists in most instances. Acute cholecystitis apparently develops only on the soil of a previously diseased gallbladder.

Cultural studies of cases of chronic and subacute cholecystitis seem to support the opinion that they are not always the result of infection. Acute cholecystitis, on the other hand, yields a much higher percentage of positive bacteriologic findings. Gordon-Taylor and Whitby[11] by means of improved bacteriologic technic, made a careful bacteriologic study of 50 consecutive cases of cholecystectomies; included in the latter were ten instances of frankly acute cholecystitis. *B. welchii* was present in five of these (three in pure culture); four showed *Bacillus coli*, and one *Bacillus coli* and *Streptococcus viridans*. This study would appear to indicate that frankly acute cholecystitis is in almost every instance precipitated by bacterial invasion either in wall of the gallbladder, the bile, calculi or in all three. Apropos of the relation of *B. welchii* to cholecystitis, it is not without interest that there are on record a number of typical violent *B. welchii* infections of the gallbladder. Brütt[12] in 1923, in a series of 130 cases of biliary tract disease, found two acute necrotic gas bacilli infections. *Bacillus coli* were also isolated in these two cases in addition to the Welch bacillus. Additional cases are reported by Kirshmayer,[31] J. Simon,[14] Koch[15] and Halle and Marquezy[16]. The latter's case is reported under the title, "Cholecystitis Gangrenosa Perforata." Clinically these patients presented no evidence enabling one to differentiate them from the usually observed acute cholecystitis. And in all of them with the exception of the one reported by Halle and Marquezy, the infection was associated with the presence of calculi in the gallbladder.

The case reported by Gunther[17] is especially interesting. Cholecystostomy was performed on a patient with acute pancreatitis, and a pure culture of *B. welchii* was obtained from the gallbladder bile. D. B. Phemister[18] operated upon a patient who had a combination of acute pancreatitis and gangrenous cholecystitis in whom cultures from the bacterial exudate revealed *B. welchii* in pure culture.

Andrews[19] notes that the finding of bacteria was about twice as common in the acute (59 per cent) as in the common cases (28 per cent). Furthermore he notes that if the cystic duct is closed the acute cases gave positive bacterial growth in eight of 11 cases; but in the chronic group it was sterile in nine out of ten cases. Andrews bacterial findings indict the *B. coli* as the organism associated with most of his postoperative disasters: It was found in nine cases, in three the patients died; a fourth patient developed a large postoperative abscess in the gallbladder bed; in the fifth profuse wound suppuration occurred resulting in hernia; the sixth patient had a fever of 105° following cholecystectomy; the seventh patient nearly died of paralytic ileus.

Concerning *Baccilli welchii*, their presence is regarded by Andrews as of

no significance, although he notes that they may be present in the gangrenous gallbladder. Considerable difference of opinion exists concerning the exact pathogenicity of the presence of Welch bacillus in abdominal lesions. (See Koch *ibid*, and discussion by W. Lohr[20] of Koch's paper.) It seems clear from available evidence that infection is a far greater factor in the acute obstructive cholecystitis, than in the other types of cholecystitis.

Certain statistical studies would appear to indicate that the mortality of surgery in the acute stage is higher. The figures of Hotz which were presented before the German Surgical Congress in 1923 are often quoted as attesting to the greater safety of the interval operation in acute cholecystitis. These collected statistics from many sources, included the pooled experience of 7,383 interval operations, giving a mortality of 6.8 per cent, while 4,761 operations done during the acute stage gave a mortality of 13.1 per cent.

Since these estimates and data are of the highest importance in determining our manner of procedure they should be surveyed with scrupulous care and circumspection. This reported mortality and morbidity of operation during the acute stage must not be accepted at face value, without some reflection. The only thing that can be compared with tangible profit is actual experience that is embodied in original data and nowhere else. The mild cases are frequently not subjected to surgery, the patients presenting violent symptoms are usually operated upon early, and moderately severe cases are allowed to subside before any surgery is considered. Most of the operations during the acute stage are not done as an emergency or at least within the first 24 hours, frequently there is a delay of some days or more before the operation is carried out, or resort is made to surgery because the symptoms have shown no signs of quieting down.

The patient may now have a local or general peritonitis, or the bowel is distended to such a degree as to resemble ileus or intestinal obstruction. There is an increasing bilirubinemia and continued absorptions of toxins. The danger as far as the liver is concerned is during the period of time the bilirubin curve is rising rapidly. It is well known that a certain proportion of cases of acute cholecystitis, while waiting for the symptoms to subside, develop microscopic icterus noticeable in the mucous membranes and conjunctivae. At times tenderness occurs along left costal margin suggesting pancreatic involvement. Certainly any surgery at this stage must give a much higher mortality.

Many surgeons have not accepted the dictum of prompt surgery in acute cholecystitis because of the fact that acute infective processes involving the gallbladder tend to become localized, and they feel so confident of this that they deliberately practice a period of delay before resorting to surgical intervention. E. R. Flint,[21] who strongly advocates a period of delay in acute cholecystitis, remarks however that the acute cases operated upon early have done very well.

Admittedly some cases will subside while waiting, but a survey of case records discloses no clinical findings that will enable us to tell what condi-

tions are present in the individual patient and which one is likely to subside and which will become worse. Furthermore, it is one thing for the process of subsidence and localization to occur, and quite another matter for the system to be continually absorbing toxins. Again, many of the gallbladder patients have some type of cardiac involvement. Schwartz and Herman[22] in a study of 109 cases of cholecystitis found that 63.3 per cent had associated myocardial disease. The sudden development of acute cholecystitis with its concomitant infection thus throws a very heavy burden on an already involved myocardium.

Microscopic study of the excised acutely inflamed gallbladder shows, in almost every instance, areas of gangrene, abscess or ulceration, at which sites acute asymptomatic perforation can readily take place.

Analyses of the cause of death following biliary operations show that more than one-fourth of its mortality is the result of peritonitis, usually local and occasionally general. Flint, in a survey of 75 postmortem examinations after gallbladder operations, notes that 27 deaths were due to peritonitis, 17 to bronchopneumonia, ten to cholangitis and ten to myocardial degeneration. The large proportion of fatalities attributed to peritonitis would seem to indicate that infection about the gallbladder is not localized as readily as we think; and that unless the operation is done promptly, it is better to wait a much longer interval than is usually done before resorting to surgery, in order to obtain complete localization of the infection.

Prompt surgical attack in acute cholecystitis should reduce the incidence of complications and sequelae, such as perforation, extension of involvement to deeper biliary passages, to the pancreas, biliary peritonitis, ileus, *etc.* Furthermore, the early removal of the acute gallbladder should also decrease the incidence of pulmonary complications. It is common knowledge that the mortality in these patients is frequently the result of some pulmonary complication. The intimate anatomic proximity of the infected gallbladder to the diaphragm would appear to be an important factor in the high incidence of pulmonary complications. In the patients operated upon early, the percentage of pulmonary complications has been definitely reduced. In addition, many very severe cases will be saved by immediate surgery.

Patients who present the clinical picture of acute cholecystitis, on admission to the hospital are clinically surveyed, and if there are no contra-indications to surgery, such as advanced age, marked obesity, advanced cardiovascular disease, severe diabetes, pulmonary tuberculosis, pregnancy, *etc.*, prompt operation is advised.

Acute cholecystitis seldom develops in the absence of calculi. Only one of the present series showed no calculi. Stone in the common duct, on the other hand, is an unusual concomitant with well-defined acute cholecystitis. Judd and Phillips[23] note in a series of 508 cases of acute and subacute cholecystitis, 43 had calculi in the common duct. In the further discussion, it is pointed out that the common duct ordinarily should not be opened during the operation for acute cholecystitis; usually it is inaccessible. In most instances the condition is not complicated by the presence of stones in the

common bile duct. If the clinical history suggests the presence of a stone in the duct, or one can be felt in it, then an attempt to remove it may be carried out. In this connection it is well to remember that some 25 per cent of patients with common duct stones have never had jaundice and about 5 per cent do not give a history of pain.

Petren in 226 cases of acute cholecystitis definitely states that whereas ten choledochotomies were necessary in this group, he did not encounter a single instance of a calculus in the common bile duct, in the presence of a clear-cut, well-defined acute cholecystitis. Judd and Phillips in their report of 61 cases of acute cholecystitis in which the gallbladder had perforated state that stones were found in the common duct in nine of the 61 cases. In none of the present series of cases has the common duct been explored. The pathology of the gallbladder is so intense that any exploration of the common duct seemed too hazardous.

It is admitted that most cases require surgery, but the decision as to the exact time lacks unanimity. One cannot be too dogmatic in any surgical question and this is no exception. One should always exercise surgical judgment and be guided by it. Weighing all the known facts concerning acute cholecystitis, the odds seem clearly on the side of prompt surgery as the safer course. This policy has been followed for the past four or five years and the results have been most satisfactory.

The operation should be a cholecystectomy unless the patient's general condition permits only the quickest and simplest surgical procedure as cholecystostomy. The latter is carried out in desperate cases, and only under local anesthesia. Cholecystectomy removes a massively infected focus, avoids the necessity of secondary operation and assures a smoother recovery. The operation, in the hands of the experienced abdominal surgeon, presents no particular difficulty. Generally the gallbladder can be peeled out with ease, since a readily established line of cleavage is formed by the pericholecystic edema. Technically cholecystectomy in the early edematous stage is easier than the similar operation, which is done when the acute symptoms have completely subsided. It is worthy of note, that eight of 61 cases of perforation of acute cholecystitis reported by Judd and Phillips,[23] had undergone previous cholecystostomy—additional evidence indicating that cholecystectomy is the operation of choice.

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CHOLEDOCHUS CYST WITH A DOUBLE COMMON BILE DUCT*

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We are presenting what we believe to be an unique case in medical history as we have been unable to find a similar report in the literature. Double common bile ducts have been reported and described, as have choledochus cysts. A double common bile duct is unquestionably an embryologic problem and we believe a choledochus cyst is also a faulty developmental condition.

Embryologists are for the most part agreed as to the development of the liver and bile passages and also that there are some features yet to be made more clear. There are still some controversial points and issues to be decided which the occurrence of double ducts and choledochus cysts raise.

The liver develops from a diverticulum given off from the ventral wall of the foregut, cranial to the yolk stalk, at a point corresponding to the future duodenum. The hepatic diverticulum soon bifurcates at its distal extremity and plunges into the ventral mesentery (septum transversum) which contains a mass of cells called the liver ridge which are destined to furnish the connective tissue elements of the liver. The bifurcated diverticulum at its distal extremities thickens by abundant cell proliferation. The numerous branches into which they are now divided are not tubes but solid cylinders of cells, the hepatic cylinders. These cords of cells are in part hollowed out to form bile ducts and bile capillaries. They acquire their lumen by the fourth week and bile is secreted before the end of the third month.

Boyden,[1] in his excellent article on double common bile ducts, covers the subject exhaustively describing a case that came under his observation and reviewing eighteen others. His contribution makes a total of nineteen reported cases. He divides aberrant ducts into two groups. The first group contains those that border the pylorus or empty farther up into the stomach. In the second group the ducts empty into the duodenum within three cm. of the usual site of the ampulla of Vater. Of the first group he says, "three interpretations may be advanced; first, that the ductus hepato-entericus is an atavistic structure representing a 'throw-back' as it were, to the double hepatic outgrowths found in reptiles, birds and some fishes; second, that it is merely a supernumerary outgrowth, analogous to an accessory pancreas; third, that it is due to a chance subdivision of the primary hepatic furrow of the embryo, resulting from some rare disturbance in factors that control the initial development of the biliary duct system." Opposed to the first interpretation,

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he points out the dissimilarity of the known cases, "hardly any two of them being alike," and secondly "to duplicate the conditions found in Sauropsida, the two ducts should be much closer together. Also if this were an atavistic condition we should expect to find it more commonly in other mammals." This he was unable to do after examining 10,000 livers in mammals without a single case of double common duct. Weissburg states "that the supposition that a double ductus choledochus might have arisen as a double liver anlage is not confirmed embryologically." Boyden supports the third interpretation, applying it to both groups, summarizing his views as follows: "With the exception of the septate ductus choledochus which is explained as arising by double vacuolization during the solid stage of the embryonic biliary tract, all cases are interpreted on the basis of chance elongation and early subdivision of the primitive hepatic furrow into two divisions corresponding approximately to pars hepatica and pars cystica. If subdivision occurs early, in such a way as to leave the pars hepatica above the zone of growth that separates the stomach and duodenum, then the pars hepatica will develop into an hepato-enteric duct emptying into the region of the pylorus. Should the division occur below this zone of growth, then both ducts will empty into the duodenum but at varying distances from each other. If separation occurs when the furrow is approaching its definitive position, then the two ducts will empty into the duodenum side by side, *i.e.*, one immediately above the other."

The following cases are illustrative of double ducts and aberrant ducts.

Laennec's case: A single common duct emptying into the stomach near the pylorus.

Vesale reported a case in which the common duct bifurcated, the upper duct emptying into the stomach above the pylorus, the lower duct emptying into the duodenum.

Filippini described a case in which the common duct emptied into the stomach through the pylorus. The pancreatic duct emptied into the duodenum 11 cm. below the common bile duct. On the pancreatic duct was found a diverticulum.

Diemerbroek's case was one of double common bile duct, both ducts emptying into the duodenum a finger's breadth apart.

Blasius' case of 1677 was similar to Diemerbroek's.

Blasius' case of 1674 showed separate entrances of the common bile duct and the pancreatic duct.

Boyden's[1] case showed a bifurcation of the common bile duct, both ducts emptying into the duodenum. The pancreatic duct emptied in common with the lower duct. Between the upper and lower bile ducts an accessory pancreatic duct emptied into the duodenum.

Gentile's case showed a very bizarre arrangement of ducts. There were two common ducts with outer and inner anastomosing ducts. Both common ducts emptied separately into the duodenum.

Kehr reported two cases. The case of 1912 showed a septum and two separate openings into the duodenum. In the more lateral duct there was a stone. In the case of 1906 the two common ducts were entirely separated but lying parallel and emptying into the duodenum very close to each other. One of the ducts contained a stone.

Rodrigues and Adrião described a very interesting division of the common duct. The two common ducts were separate throughout. Each duct was formed by the junction of two ducts, one from the quadrate lobe going to each. In Amussat's case the arrangement

of the ducts was similar to that of Rodrigues and Adrião's, excepting the gallbladder was absent.

Karpa and Katz reported two cases. Both were associated with atresia of the

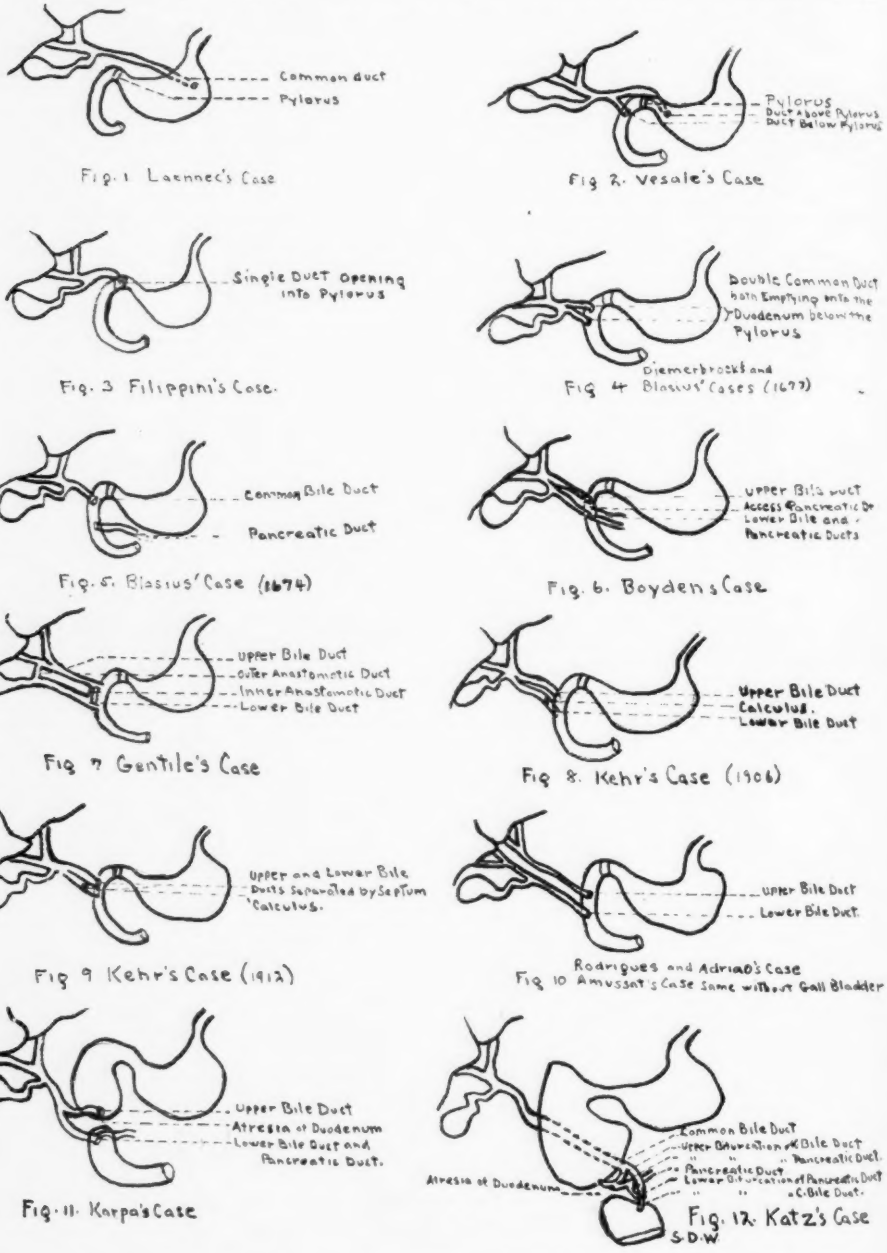

PLATE 1.—Diagrammatic sketches showing the arrangement of the bile passages in the reported cases of double common bile ducts and aberrant ducts.

duodenum. In both cases the common duct bifurcated, one branch going into the upper segment and the lower branch emptying into the lower segment of the duodenum. The

second case was similar except that the pancreatic duct bifurcated also, a branch going to the upper and lower bifurcations of the common bile duct.

The symptomatology is not characteristic. The patients are usually free of symptoms until obstruction of the patulous duct by stone or infection occurs, in which case indigestion, pain or jaundice with localized tenderness leads the observer to the diagnosis of biliary tract disease.

Turning our attention now to choledochus cyst, we find a condition that is rare but not as rare as double choledochus duct. Judd and Greene[2] found one case out of 17,381 operations on the bile ducts over a period of twenty years at the Mayo Clinic.

M. M. Zinninger and James R. Cash[3] have recently reviewed the literature, collected the reported cases and analyzed the subject in a very comprehensive and excellent paper. They have accepted 82 as true cases from an analysis of 109 reported cases and have added one of their own, bringing the total to 83. These do not include those cases caused by complete occlusion with stone, tumor, traumatic stricture, pancreatitis or complete atresia of the common duct in children.

The etiology here again is pathologic embryology. Zinninger and Cash under etiology quote various authors who have proposed the following explanations.

Congenital malformation with congenital atresia of the common duct.

An abnormal course of the duct through the duodenum causing kinking and obstruction.

A valve-like fold at the mouth of the intraduodenal portion of the duct.

Congenital narrowing of the duct due to the presence of infection.

Congenital weakness of the wall of the duct.

A complication of pregnancy, pressure causing twisting or kinking.

Primarily congenital with modifying factors—infection, spasm, kink, valves or atresia.

Trauma has been offered as a cause.

Pancreatic adenomas.

Pressure on the common duct by enlarging tuberculous mesenteric glands.

In their case they believe two factors were responsible, first, congenital malformation; second, infection.

In analyzing the 82 cases, Zinninger and Cash found the condition occurred more frequently in females 68 to 14. There were 28 cases found in patients ranging in age from birth to ten years; 22 cases from 11 to 20 years; 20 in those from 21 to 30; seven from 31 to 40; and seven in all those over 40.

Pain and jaundice occuring intermittently and the presence of a tumor mass in the upper abdomen were the most common findings. Pain was reported in 43, jaundice and tumor in 60. In seven of the cases the symptoms were accentuated by pregnancy. Mild fever was fairly frequent.

The correct diagnosis has been made only three times preoperatively, considered in a fourth but rejected in favor of a more common disease. In 18 cases echinococcus cyst was given as a preoperative diagnosis, pancreatic cyst

seven times, stone in the common duct six, mesenteric cyst three, cholecystitis four, enlarged gallbladder three, malignant growth, tuberculosis and cyst of the kidney twice each; retroperitoneal tumor, intestinal obstruction, ovarian cyst, catarrhal jaundice, perforation of the gallbladder and cyst of the liver once each. The diagnosis has been missed frequently at the time of operation.

The pathologic findings have been much the same. The gross appearance is that of a large, tense, spherical, cystic tumor in the right upper abdomen below the liver, displacing the stomach to the left and the duodenum downward. The cyst is usually found retroperitoneal. In all but two cases the cyst involved the extraduodenal portion of the duct only. In the other two cases the cyst apparently involved the entire length of the duct. In three other cases the pancreatic duct entered the cyst. The surface of the cyst is usually very vascular. Their size has varied considerably, as has the thickness of the wall.

The results of the various methods of treatment are interesting and instructive. The total mortality of the 83 cases was 65 per cent. Of 27 cases drained only, 24 died. Drainage with secondary anastomosis resulted in five deaths out of 14. Excision of the cyst with anastomosis of the hepatic duct to the intestine resulted in one death out of three cases. Excision of the cyst with secondary anastomosis of the hepatic duct to the intestine was done successfully in the one case reported. Excision of the cyst without anastomosis was done six times with six deaths. To summarize: the mortality in all untreated cases, those aspirated alone and those excised without anastomosis was 100 per cent; by drainage alone 88 per cent; drainage with secondary anastomosis 35 per cent, and primary anastomosis 28.9 per cent. It is obvious from this review, primary anastomosis offers the best prognosis, choledochoduodenostomy being the procedure of choice.

Case Report

D. M., four years old, white male, admitted to the service of Doctor Swartley in the Germantown Hospital Dec. 8, 1932. The chief complaints were nausea and abdominal pain which began three days before admission. He was awakened with pain in the upper abdomen at night. A few days later he vomited. The past and family history were negative. The physical examination revealed a pale child complaining of pain in the abdomen. The tongue was coated and dry. There was moderate abdominal distention and definite tenderness in the epigastrium was elicited. No mass could be palpated. On close observation a peristaltic wave was plainly visible passing from the upper right abdomen across the epigastrium. The child was constipated the next few days, relieved only partially by enemas. The diagnoses were possible intussusception or chronic appendicitis. On admission the temperature was 98.3° F. with an elevation to 100° F. the following day. The pulse ranged between 96–120. The red blood cells 4,080,000, hemoglobin 68 per cent, white blood cells 14,600 with a differential count of neutrophiles 70 per cent, lymphocytes 27 per cent, mononuclears three per cent. The urine was negative.

Operation Dec. 13, 1932. Through a right, mid-rectus incision the cecum was delivered and the appendix, which was normal, removed. In exploring the upper right abdomen a mass was palpated above and behind the hepatic flexure of the colon and below the liver. The rest of the colon was normal, no intussusception or volvulus found nor a Meckel's diverticulum. Our attention was then focused on the mass in the upper right abdomen.

The stomach was displaced to the left and the duodenum to the left and downward. The gallbladder was enlarged, the cystic duct expanded into the cyst giving the gallbladder the appearance of being a part of the cyst (Fig. 1). The cyst was covered with a layer of peritoneum containing a network of blood vessels. The presence of a choledochus cyst was strongly suspected. The cyst was freed above and below. Another structure was exposed running through the gastrohepatic omentum, which had the appearance and size of a normal common bile duct. The mass was further freed at the duodenum and a narrow duct leading from the cyst to the duodenum was exposed. This duct was ligated and the cyst further freed. The gallbladder was then freed from the liver and further separation of the cyst on the outer side disclosed another duct which was ligated and cut. This duct coursed through the gastrohepatic omentum in the direction of the porta hepatis (Fig. 2). Due to the shocked condition of the patient tracing of the ducts could

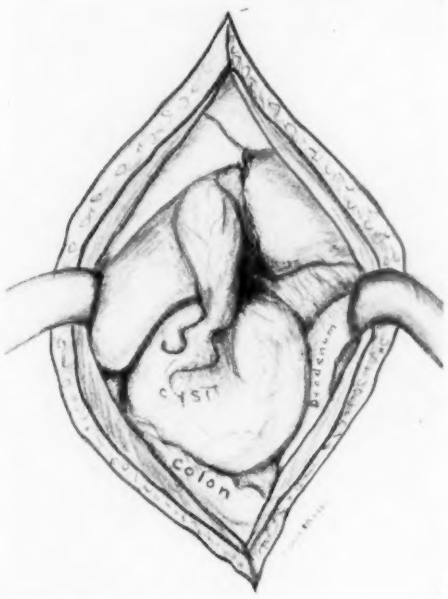

FIG. 1.—Showing the choledochus cyst at the time of operation.

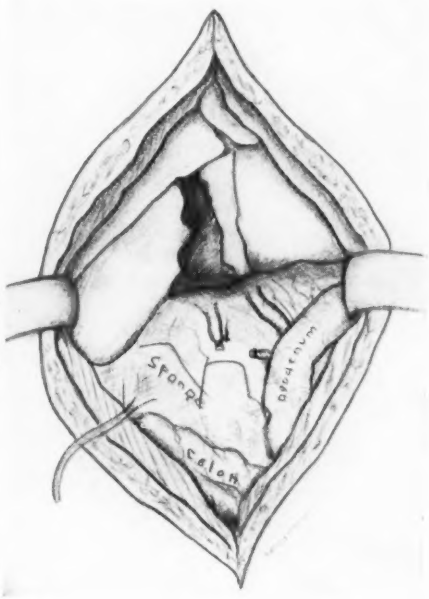

FIG. 2.—Showing the operative field after removal of the choledochus cyst with double common bile duct, ligatures having been placed on the proximal and distal ends of the divided duct, the remaining duct running through the gastrohepatic omentum from the liver to the duodenum.

not be done with safety. However, the duct running through the gastrohepatic omentum from the porta hepatis to the duodenum was exposed further to be sure it was a duct. We believed that there was a complete division of the common duct, the duct that remained draining the left half of the liver and the duct entering the cyst on its lateral side drained the right half of the liver. As this duct was ligated we speculated on what change, if any, there would be in the liver. A cigarette drain was placed in the subhepatic fossa and the abdomen closed.

Following operation there was some distention of the abdomen but no jaundice. Two days postoperative there was a positive direct van den Bergh reaction, indirect 2.75 mgms. bilirubin per liter. There was a profuse drainage of bile until Feb. 18, 1933, after which time drainage into the duodenum was established, and the stools became brown in color. He was discharged Mar. 27, 1933, in good condition.

Pathologic Report.—Gallbladder 49 by 16 mm., cyst 50 by 74 by 62 mm. Presents

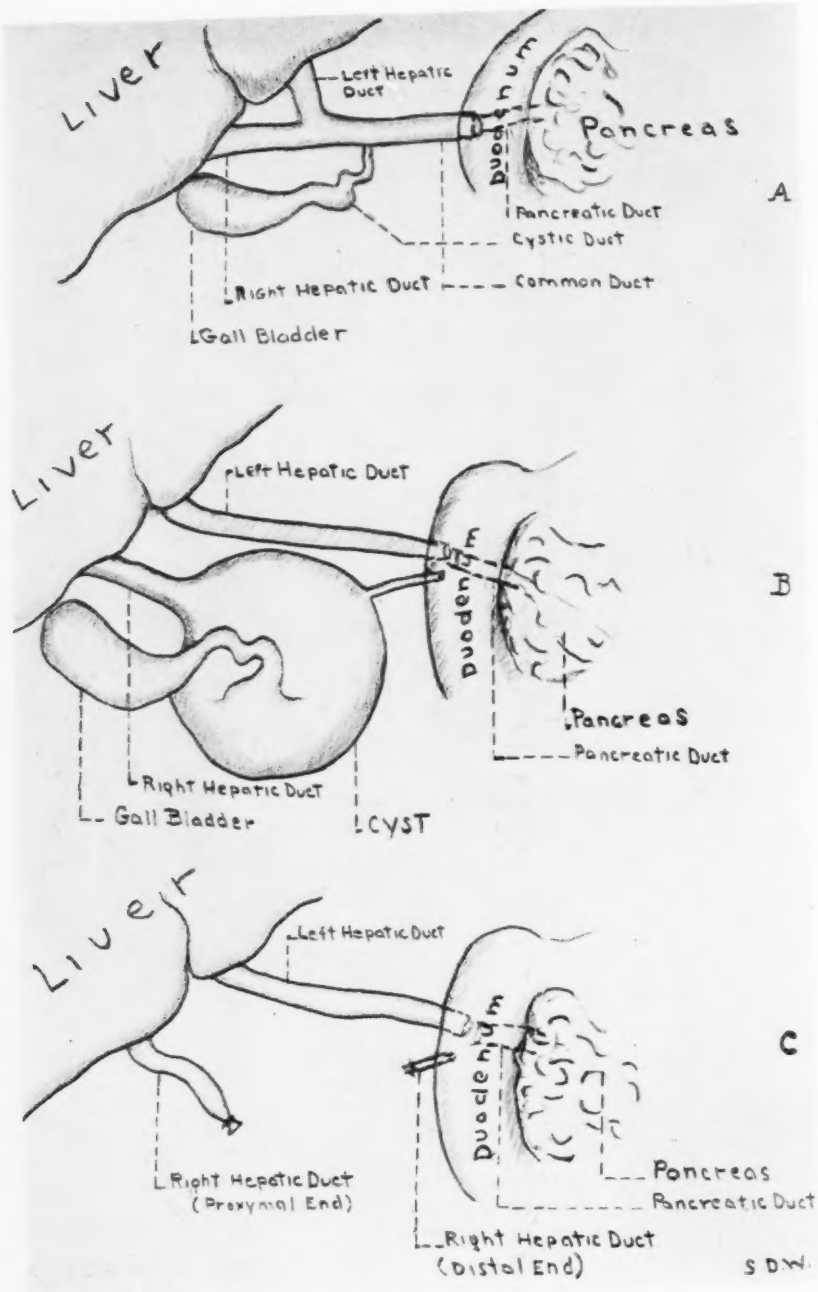

PLATE 2.—Diagrammatic sketches showing (A) Normal arrangement of bile passages. (B) Present case of double common duct with choledochus cyst before operation. (C) Resultant postoperative anatomy.

two ductal openings, contains approximately 150 cc. fluid which appears to be bile. Section of cyst wall and gallbladder wall taken. The specimen has undergone some degeneration but careful examination reveals that the section of gallbladder shows the following: The mucous coat is covered with a somewhat flattened layer of epithelium. This is for the most part marked off in regular ridges. The submucosal layer shows a good many degenerated fibers, some of these having nuclei which suggest muscle. This is intermingled with fibrous connective tissue. The bundles through this area are for the most part circular but here and there are other areas of interwoven longitudinal and oblique fibers. The outer coat is definitely fibrous. The cyst has a histologic structure suggestive of the common bile duct. The muscular layer is more prominent and appears to be more circular in type. There is less fibrous tissue throughout the specimen. The epithelium is markedly flattened. The nuclei are pale staining and show a marked degeneration which I believe is due to the fact that it has been under considerable pressure. Both specimens show postmortem changes of degeneration and are somewhat indefinite in architecture.

We examined the patient on Mar. 31, 1934, with the following findings: The mother states that the child has been in better health than ever before. There has been a gain in weight of 10 pounds since leaving the hospital. There have never been jaundice or digestive disturbances noted. The stools were occasionally light in color but during the past six months this has rarely occurred, the stools being usually a dark brown. The abdomen is not tender. The liver, probably the left lobe, may be palpated in the epigastrium and to the left as a round smooth mass, the lower border easily palpable and sharp. The right lobe cannot be palpated. The lower border extends to within an inch of the umbilicus.

SUMMARY.—We have presented, we believe, the only case reported of choledochus cyst with double common bile duct. The literature covering choledochus cyst and double common bile ducts has been reviewed. We are of the opinion that choledochus cyst with double bile duct may occur more often; that a thorough search has not been made in those cases of choledochus cyst for a second common duct. That as obstruction to the duct would seem to play an important rôle in the etiology of choledochus cyst, a second duct if it be present will in all probability be sufficiently large and of sufficient diameter to adequately drain the bile into the duodenum.

In our case during the period of two months during which bile drained from the wound intermittently, we were tempted to question the adequate patency or even presence of a second duct which we had believed existed at the time of operation. The profuse drainage of bile depleted the child so greatly that at one time we contemplated collecting the bile and introducing it through a nasal catheter into the stomach. A rhino-pharyngitis prevented this. A subsequent middle ear disease and mastoiditis probably resulted from the lowered resistance due to the loss of bile. The abdominal wound drainage of bile ceased on Feb. 18, 1933, and has not recurred since. It is therefore obvious that there is a patulous common duct remaining.

The hypertrophy of the left lobe of the liver at this time would seem to verify our thought of the arrangement of the ducts and be the answer to our speculation as to the future reaction of the liver, that there was a separate duct for the right and left sides of the liver and as the duct draining the right side was ligated, the right lobe of the liver has atrophied and the left

lobe draining through the remaining duct has undergone a compensatory hypertrophy.

These facts therefore bear directly on treatment. As the mortality is high for the best operative procedure used up to this time, namely, choledochoduodenostomy, it is probable that excision of the cyst in the presence of double common bile duct, the remaining duct being patulous, would result in a lower mortality rate, as excision of the cyst is a far simpler procedure than the more technical and shocking procedure of choledochoduodenostomy.

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CHANGES IN THE BILIARY SYSTEM AFTER CHOLECYSTECTOMY

THE CAUSES OF RECURRENCE OF GALLBLADDER SYMPTOMS

By Stanley Eiss, M.D., and James H. Whaley, Jr., M.D.
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In a recent article, Eiss[1] discussed some of the after-effects of biliary surgery, and pointed out certain precautionary measures which served to prevent many of the so-called "liver deaths" which too often bring to a fatal termination operations undertaken in full expectation of a perfectly successful outcome. This fatal syndrome would seem to follow traumatization of the ducts during gallbladder operation. Injury to the bile ducts involves biliary obstruction, and this in turn reacts with increased damage to the liver.

By way of explanation, the blood supply of the liver is peculiar in that the individual cells of this gland receive their blood supply from the portal vein alone, while the hepatic capsule and the bile ducts are included in the circulation of the hepatic artery. Therefore, any injury to the blood vessels of the biliary tract has an immediate deleterious effect upon liver function, because within the liver cells we do not find an interchange between an arterial and a venous system but a special relation between the portal and the biliary circulation.

The contention of the paper referred to is that a meticulous cholecystectomy technic will go far to improve the end-results and lower the operative mortality of gallbladder surgery. But even when "liver deaths" are successfully avoided, the end-results of cholecystectomy often prove most unsatisfactory to patient and surgeon alike. With a technic which is absolutely faultless, there are still many cases where there is recurrence of symptoms, often equaling if not exceeding the violence and gravity of those which originally brought the patient to operation.

Despite the popularity of intervention for the extirpation of the gallbladder, there is a steadily increasing protest against it. As far back as 1900, the Italian surgeon, Benedetto Schiassi,[2] advocated its less extended use, and in its place put forward a form of cholecystotomy, which he termed "cholecystendysis." At the International Congress on Biliary Lithiasis, held at Vichy in 1932, he repeated his assertions made more than thirty years earlier, and discussed at length the reasons for the poor functional results and frequent recurrences of biliary inflammation witnessed after the most technically correct surgery.

While many of the surgeons in attendance at this Congress were less outspoken in their condemnation of too frequent resort to removal of the gallbladder, the net result of their discussion was finally drawn up and put on

record. Summarized, this record shows that following cholecystectomy there occur:

(1) A progressive destruction of the epithelium of the large liver ducts, with degeneration of their elastic tissue and fibrous transformation of their walls.

(2) A greatly increased susceptibility to infection on the part of the biliary ducts.

(3) A far greater liability to intestinal putrefaction and an increase in the virulence of the intestinal flora.

(4) A reduction of at least two-thirds in the amount of pancreatic secretion, and finally,

(5) A definite alteration in the function of intestinal digestion in regard to the transformation and assimilation of fats, it having been estimated that in place of the normal 10 per cent., from 30 to 35 per cent. of ingested fats pass out in the feces without being absorbed.

All these, as Schiassi points out, are *intrinsic* effects. Of *extrinsic* effects, concerning which the considerations of the Congress apparently did not go on record, he mentions:

(1) The possible effects of inflammation of the pancreas.

(2) The constriction of postoperative adhesions upon the hepatic canal and the bile ducts.

(3) The periduodenitis and pericolitis so often induced by the formation of fibrous bands, frequently necessitating secondary gastro-enterostomies or ileo-transversostomies.

(4) Postoperative biliary fistula, and

(5) Pain in the hypochondrium, which is apparently due to irritation or compression of the nerve plexus of that region by adhesions.

In addition to the lesions which may result as "mechanical" effects of extirpation of the gallbladder, we must likewise consider that removal of that organ, no matter how greatly diseased and functionally altered it may have been, does not necessarily do away with all the pathologic conditions which originally produced the inflammation and stone formation. May not the "liver deaths" which have followed the most perfect technical performance be due, at least in some instances, to what the French have called "foie lithogène," which may perhaps be best translated as "liver with a tendency to produce stones"? Such a liver would be composed of cells which are organically so constituted that not only in its biliary ducts, but also in its glandular tissues, it would secrete a bile predisposed to calculus formation.

When the surgeon has removed the gallbladder, this calculus forming tendency of the liver is in no wise lessened, and it is easy to see that the conditions which produced disease in the gallbladder will continue to operate when it has been taken away. More than that, the loss of the reservoir for bile will so alter the natural relations of this part of the digestive tract that the tendency toward disease will be increased, rather than lessened. Let us consider the origin of the inflammatory process which we term cholecystitis

in its relation to the after-effects of cholecystectomy, as enumerated by the European students of the subject.

So far as the present writers are aware, there are few, if any, authentic observations upon incipient cholecystitis. The most common site of infection is apparently Luschka's crypt, the lesion usually first observed being an infiltration of the bladder wall by diffuse cellulitis, the mucous lining of the ducts often being extensively ulcerated. The cores of these ulcers may be deep, and it is within them that gall stones are liable to form, or stones formed elsewhere in the tract find lodgment, and by irritation of portions of the wall surface hitherto unaffected, soon induce more extensive inflammation. If the ulceration is very deep, the stones may even erode their way entirely through the wall, so that at operation or autopsy they will be found free in the peritoneal cavity or possibly to have perforated the wall of the large intestine, if this has been attached to the gallbladder by adhesions from previously existing inflammation.

Chronic recurring cholecystitis denotes a condition where stone formation is continuous and stagnating bile keeps the mucosa constantly ulcerated. An active healing process is going on at the same time, so that the wall becomes much thickened by cicatricial formations. Sooner or later the outflow of bile from the liver is obstructed or altogether inhibited. The cells forming the walls of the bile capillaries within the liver are rapidly destroyed, and it is not long before these capillaries rupture, their structure being weakened not only by dilatation due to retention of their content but to its corroding effect as well. The fact that the cells are compelled to cease exercising their normal functions doubtless assists in their eventual destruction.

Whether the gallbladder is removed or deprived of its physiologic function by obstruction of the cystic duct, the resulting pathologic changes in the ducts and the liver itself will be very similar. The entire duct system will dilate, and after a certain lapse of time, the bile secreted will be absorbed into the general circulation. Schiassi[2] has put forward the hypothesis that the presence of calculi in the gallbladder disturbs the normal excretion of bile, and thus brings about disturbances of intestinal digestion not only in the jejunum but also in the colon. These digestive difficulties are increased, rather than lessened, by removal of the infected gallbladder, and the formation of intestinal toxins still further taxes the liver. Since this liver is, in his opinion, always a more or less anomalous type of organ, being congenitally disposed to the formation of concretions, the poisonous substances brought to it by the portal circulation still further carry on the vicious circle inaugurated long before the gallbladder was removed or "short-circuited."

It is also possible that such a state of auto-intoxication might arise in the intestinal tract (colon and cecum) that poisonous products would be carried by the portal circulation in such great quantity that the liver would be unable to handle them, and, in an individual constitutionally disposed to stone formation, it would take place before reaching the bile ducts or the gallbladder. These concretions would later be forced into the biliary system

and would there set up a "recurrence" of a previous cholecystitis, or be the original cause of such an inflammatory condition.

This hypothesis, too, would account for obstruction of the ducts when the conditions usually conceded to favor cholecystitis are not in evidence. This can take place, of course, whether or not the gallbladder is present or absent, active or functionless. There is no doubt that removing the gallbladder can have a serious effect upon the normal physiologic function of the entire digestive phase over which the liver presides. The biliary system loses that part of its mechanism devoted to the concentration and storage of bile. When digestion is actively going on, the secretion of bile is readily taken care of; but as this process continues when digestion is quiescent, the bile secreted, lacking a reservoir, collects in the ducts outside the liver, which are forced to dilate in order to hold it. They are able to accomplish this so long as the sphincter of Oddi remains competent. But it was shown by the animal experiments of the great anatomist whose name this valvular structure bears that there comes a time when the sphincter muscle loses its tone and becomes permanently relaxed. Then the normal entrance of bile into the intestine, which is intermittent, is changed to a practically continuous flow, which often completely upsets the normal rhythm of the digestive cycle and may lead to grave disturbances, which many clinicians fail to attribute to their proper cause. Through the relaxed sphincter, too, many noxious intestinal inhabitants are now able to make their way, and it takes no very lively imagination to foresee the gravity of the possibilities thus admitted.

There is already an abundance of evidence that the gallbladder is by no means a useless survival of an earlier physical structure, as it has been so generally regarded, nor is the argument that elephants have no gallbladders strong enough to warrant the wholesale removal of this organ from the human subject. Yet nothing has so far been adduced which contraindicates the wisdom of taking away diseased and functionless tissue, serving as a focus of infection, and the generation of toxins and harmful concretions which are capable of exercising a deleterious influence over the entire body. The need apparently is for better means of detecting gallbladder infection while it is still localized, for improved methods of diagnosis of the extent and virulence of the disease, and for better surgical technic in dealing with the liver, which cannot be excised, yet plays the chief rôle in that complicated performance which we term biliary digestion.

If gallbladder cases could come into the surgeon's hands earlier, the need for radical extirpation would undoubtedly be greatly reduced. In such early cases, biliary drainage would be feasible, and in the great majority would be all that would be needed to take care of the incipient conditions. At present, we are far indeed from this ideal. By the time the gallbladder patient reaches the surgeon, so many and so great pathologic changes have taken place that drainage without the removal of functionless and poisonous tissue is no longer to be considered. More than that, the delay has usually been so long

that the patient's general systemic condition has become so poor as to greatly enhance the dangers of any sort of operative interference.

It would seem that more intensive training of the general practitioner, who is the first to see most of these patients, in the prompt recognition and immediate treatment of gallbladder disease would be the chief aid in bringing them early for such operative treatment as may be needed. Persistent propaganda in regard to tuberculosis and cancer has actually succeeded in bringing about a substantial increase in the number of cases coming early under observation. Why cannot the same be made true in the instance of cholecystitis? which, while not carrying so solemnly impressive a death rate as the two diseases just mentioned, is yet a major cause of disability in the fifth and sixth decades of life.

Another reason for the frequently unsatisfactory results obtained by the surgeon operating upon the diseased gallbladder has already been mentioned: his inability to remove the damaged portion of the liver which was, in all probability, originally responsible for the gallbladder lesions. If he could remove all the stone forming elements, it is reasonable to suppose that stone formation would be at an end. But as he cannot discover all the possible sites of infection, nor make sure that he is leaving no nuclei for further concretions in the ducts of the liver itself, the safest plan appears to be careful exploration and the institution of drainage, leaving excision to be practiced only as a last resort, when more conservative measures fail to bring relief. It should not be enough that our patients escape "liver death." Taken in time, we should be able to rid them entirely of the distressing conditions under which they have suffered, and by good judgment and careful surgery restore each one to an approximately normal condition.

SUMMARY

(1) The end-results of gallbladder surgery are frequently disappointing to both physician and patient. Poor functional results and a recurrence of the biliary inflammation too often follow the most meticulous surgical performance.

(2) Eminent biliary surgeons have noted increased intestinal putrefaction, a two-thirds reduction in pancreatic secretion and a decrease in the ability of the intestine to digest fats after cholecystectomy. Autopsy and reoperation have repeatedly shown destruction of the epithelium of the liver ducts with degeneration and fibrosis of their walls, together with increased susceptibility to infection.

(3) The removal of the gallbladder not only fails to do away with all the pathologic conditions co-existing with disease of that organ, but it actually inaugurates a new cycle of disturbed function by depriving the liver of a reservoir in which to store up bile, the surplus of which must therefore be stored in the ducts until they are dilated and permanently injured.

(4) Long continued dilatation eventually destroys the functional ability of Oddi's sphincter, which, remaining permanently patent, ceases to hold back

the bile from flowing continuously into the intestinal canal and likewise permits the entrance of pathogenic organisms from the large gut into the biliary tract.

(5) If these cases could be seen earlier, biliary drainage would usually be all that would be necessary in the way of surgery to correct the tendency toward stone formation and give permanent relief from gallbladder symptoms.

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SKIN GRAFTING

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The great number of traumatic cases handled by the surgical service of the Cincinnati General Hospital, as well as the relatively large number of chronic ulcers and the many radical breast amputations requiring skin grafting for primary closure, has made skin grafting of peculiar interest in this clinic. The purpose of this article is to describe certain procedures which in a large measure represent variations of well-established principles of skin grafting.

A Method of Holding Large Ollier-Thiersch Grafts in Place.—Ollier-Thiersch grafts are cut and placed on the wound following the technic described by Davis in his text-book of plastic surgery. Formerly these grafts were prevented from slipping by either fine black silk sutures or by skin clips placed at short intervals where the graft overlapped onto normal skin. Both of these methods were objectionable because the application of either sutures or clips was time-consuming, likely to derange the grafts, and most important, likely to produce a slough in the skin at the margin of the wound. Lately, small drops of collodion have been used to hold the grafts in place. (Fig. 1.) The graft and surrounding skin are first dried with a piece of gauze. A cotton applicator dipped in collodion is touched to the margin of the graft at intervals of three or four centimeters, wherever it overlies the normal skin. The collodion seals the graft to the skin immediately and stays adherent for several days. This procedure has proven an entirely satisfactory substitute for the older methods of fixing Thiersch grafts.

The Dressing of Ollier-Thiersch Grafts.—After the grafts have been placed and secured as described above, several thicknesses of flat gauze moistened in normal salt solution are laid over the grafted area. These moistened gauze compresses are allowed to extend only a short distance beyond the wound margin. Next, a single layer of rubber protective (Stanley gutta percha) is laid over the moistened gauze. (Fig. 2.) This rubber protective extends beyond the moist gauze and is allowed to cover a small margin of the surrounding normal skin so that it will keep the gauze from drying out before the first dressing. Over the rubber protective several flat moist gauze sponges are placed and then covered with another layer of rubber protective. Fluffed gauze held by adhesive bandages or a cast completes the dressing.

The first dressing is not disturbed for five to seven days unless the development of a fever makes an investigation of the wound necessary. When the dressing is removed the gauze immediately overlying the grafts will be found to be still moist and not adherent to the grafts. The grafts will be dry and show no maceration, which is not the case when rubber protective is placed next to the grafts.

The Use of Small Ollier-Thiersch Grafts.—Large Ollier-Thiersch (Fig. 3) grafts are employed to cover surfaces denuded of skin in the course of a clean operation. At one time this same type of large Thiersch graft was used to cover traumatic wounds requiring immediate grafting, and also occasionally for granulating surfaces. In most instances this technic was satisfactory but occasionally a collection of serum would elevate a part of the graft in spite of the holes that were clipped in it, or the secretions would become purulent and cause the graft to melt away. It seemed that the larger the graft the more uncertain was its likelihood of taking on freshly débrided or granulating surfaces.

Therefore, for such surfaces small squares or rectangular pieces of Thiersch graft are now employed to cover the wound. The important point is that only two or three square centimetres be in each graft. Such grafts seem to be extremely hardy, in one instance growing on a surface that had failed to support pinch grafts.

The technic of this method of grafting is simple. Large Thiersch grafts are cut and spread "cut surface up" on a flat piece of rubber protective. The rubber protective is then cut around the margin of the graft so that the graft, and rubber protective which holds the graft, can be handled easily. With a pair of scissors the small pieces of graft and rubber protective are cut from the large graft. The small pieces are then placed on the surface to be covered and the adherent rubber protective teased from the outer surface of the graft. Care should be taken that the pieces of graft do not curl

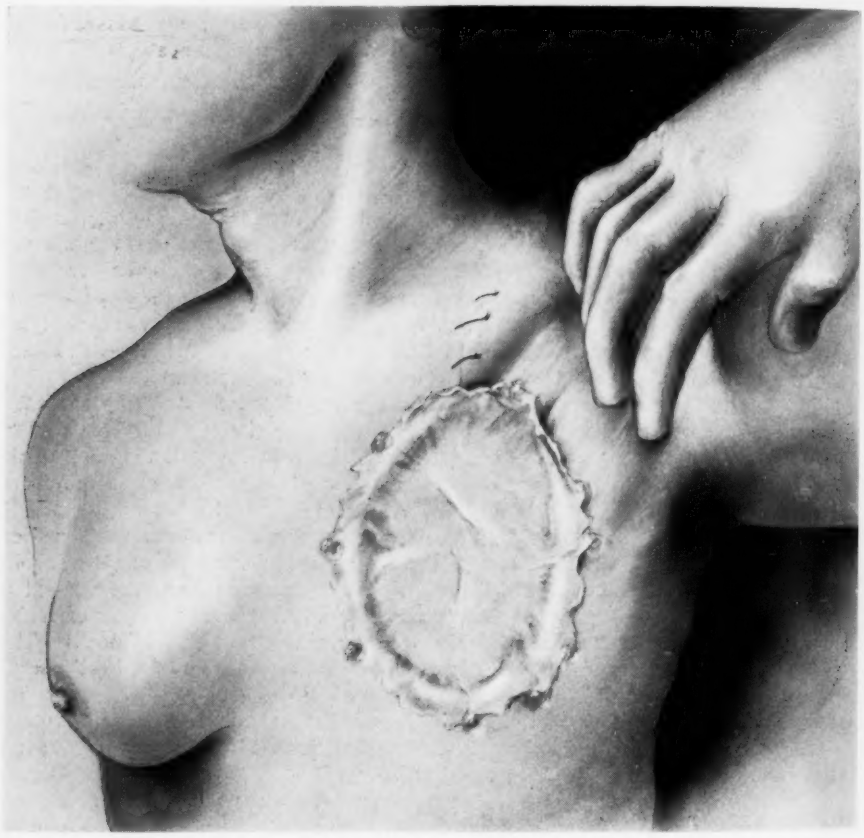

FIG. 1.—The grafts are fixed by using small drops of collodion placed half on the edge of the graft and half on the surrounding skin.

at the edges. If the graft should curl it can be straightened easily by sliding it back and forth with the point of the scissors. In general, the distance between the grafts depends on the size of the wound to be grafted; in the case of small wounds, the grafts are placed two or three millimetres apart, whereas in the case of very large wounds the grafts may be placed a centimetre apart.

The dressing for these grafts consists of a single layer of gauze pressed down on the surface of the grafts and held in place by a paste of zinc oxide and castor oil that has been spread about the margin of the wound. A sheet of rubber protective in which many holes have been made is next placed over the single layer of gauze. The dressing

is completed by adding several fluffed gauze sponges which are held in place by strips of adhesive. Such a dressing is not changed for four or five days unless fever or abundant secretion makes investigation of the wound necessary. Occasionally, when there is a likelihood of infection, after fixing the grafts with the single layer of gauze held by the zinc oxide in castor oil no additional dressings are used, leaving the grafts exposed to the air for eight or ten hours. Following this period compresses moistened in normal saline solution are placed on the single layer of gauze which holds the grafts in place. These compresses are changed every four hours. Dakin's compresses can be substituted if the secretions become purulent or the granulations between the grafts become exuberant.

After the fifth or sixth day, when the grafts have taken well, all moist dressings are

FIG. 2.—The grafts have been covered with several thicknesses of moist gauze and the first layer of rubber protective is being applied. The rubber protective should extend beyond the gauze on all sides.

discontinued and old linen covered with a very thin layer of lanolin or vaseline is used to cover the grafted area. This dressing is continued until epithelization is completed unless the character of the granulations between the grafts requires a change back to either normal salt solution or Dakin's compresses.

This method of employing small pieces of Thiersch graft to cover granulating surfaces and freshly débrided surfaces has largely replaced the use of pinch grafts in the Cincinnati General Hospital. The epithelization, by this method, takes place more rapidly, the likelihood of a take is more certain, and the resultant epithelium is as serviceable as that afforded by pinch grafts.

Either pedicle grafts or free transplants are used when thicker skin is required or the excessive contracture caused by small Thiersch grafts is undesirable.

FIG. 3. The small squares of Ollier-Thiersch graft are spaced farther apart than usual. Photograph taken one week after grafting.

Treatment of the Area from Which Ollier-Thiersch Grafts Are Taken.—The wound left by the removal of Ollier-Thiersch grafts is often more troublesome, and confines a patient to the hospital longer, than the area grafted. Five or six thicknesses of vase-

FIG. 4.—Photograph of area from which Thiersch graft was removed five days after treatment with 2 per cent. aqueous tannic acid solution.

line gauze covered by rubber protective, dry gauze and adhesive is the dressing that has usually been applied to the site from which Ollier-Thiersch grafts have been taken. This dressing would be left in place as long as it remained clean, but frequently it would slip or be soiled in one way or another. The wound would then require dressings of

either vaseline gauze or compresses of normal salt solution. Healing in such instances has been very slow and the dressings have been very painful.

Recently the freshly denuded surface of the thigh has been treated with a 2 per cent. aqueous solution of tannic acid. (Fig. 4.) The bleeding surface is first dried with normal saline compresses, then sprayed with the tannic acid solution every fifteen minutes until a hard dark brown or black surface appears. This usually requires about two or three hours and can be done in the ward. The only precaution to be observed is that nothing be allowed to touch the wound until the hard coagulated surface forms. A cradle is usually placed over the thigh for twenty-four hours to protect the wound from the bedclothes. There is no danger in allowing the tannic acid solution to come in contact with the surrounding normal skin because its coagulating action takes place only on the denuded surface. After the sterile coagulated surface has formed no dressing is required. Many patients have been allowed up the next day. In about two weeks the coagulated surface is separated from the thigh by the normal epithelium which grows underneath it.

Tannic acid solution should not be used on certain cases. If, in cutting the grafts, the knife has exposed the fat, tannic acid should not be employed because no tanning

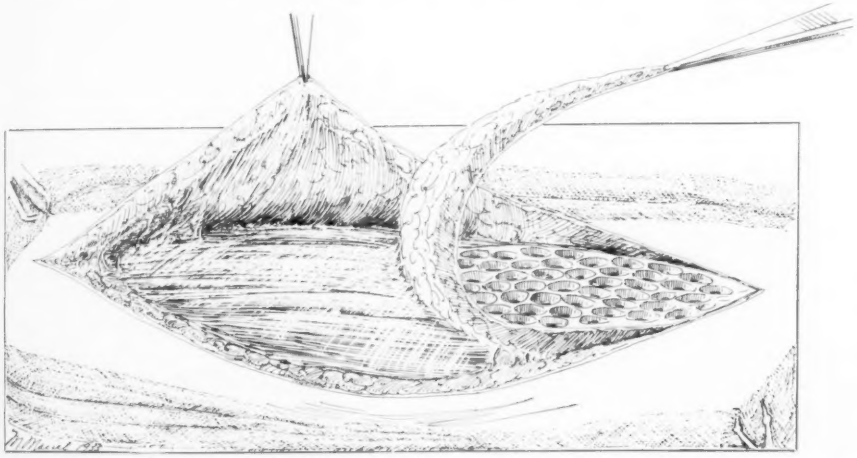

FIG. 5.—Illustrating the removal of the elliptical area from which the grafts were taken and also the necessary undermining of the wound edges in order that closure can be made without undue tension.

effect takes place over the fat and the resulting open area in the coagulated surface serves to allow infection to undermine the area. If a tanned surface is undermined by infection it should immediately be removed. An uncoöperative patient should not be treated with the tannic acid solution; he may pick at the dried scablike surface until bleeding and infection occur. Occasionally the coagulated surface is covered by a sterile dry dressing to prevent this complication. In spite of these contraindications the method works well in the majority of cases.

Treatment of the Area from Which Pinch Grafts Are Taken.—Formerly pinch grafts were removed in parallel rows, care being taken to begin with the most dependent row so that its bleeding would not interfere with the removal of grafts above it. The wounds left by the removal of the grafts were dressed with vaseline gauze. Lately the area from which the grafts are taken has been excised and closed. First, an elliptical area containing about the required amount of skin is outlined. All the pinch grafts are taken inside of this elliptical area and are cut so close together that practically no epithelium is left inside the elliptical area. If the grafts are placed on the granulating surface as they are removed, the needles should be passed through a flame before being returned

to the area from which the grafts come. Since this area is to be excised and the skin undermined, it is essential that this field be kept sterile. Usually all the grafts are removed at one time and placed on a sterile towel while the area from which they came is excised. The excision removes the entire elliptical area and underlying fat down to the fascia. It is necessary to undermine the sides of the wound so that it may be closed without undue tension. (Fig. 5.) If the elliptical area is only about four centimetres wide at its widest point, it can be closed easily with interrupted sutures of fine black silk. These sutures are left in place for eight or nine days, and then alternate sutures are removed on one day and the rest on the following day. This procedure differs from that advocated by Masson* in that no Thiersch graft is cut from the area to be removed.

* Masson, J. C.: Skin Grafting. J. A. M. A., vol. 70, pp. 1581–1584, 1918.

TRANSACTIONS
OF THE
NEW YORK SURGICAL SOCIETY

STATED MEETING HELD MAY 9, 1934

The President, Dr. Allen O. Whipple, in the Chair

SOLITARY LIVER ABSCESS

PROBABLY AMŒBIC

Dr. Carl Eggers presented B. M., thirty-six years old, admitted to Lenox Hill Hospital January 28, 1934. He had been in good health until about eleven weeks ago when he became ill rather suddenly with general malaise, fever, and a nonproductive cough. Fever had not been high at first, but rose to 104° during part of the course. He had had occasional pain in the right lower chest, in the axillary region, but this had never been severe. Cough had been unproductive throughout, and there had not been any hæmoptysis. During the early part of his illness a diagnosis of bronchopneumonia had been made. Because of the unsatisfactory course of his illness empyema was suspected, but *x*-rays of the chest showed nothing definite and exploratory punctures had been negative. He had complained a great deal of nausea without any other gastro-intestinal symptoms. There had been no abdominal pain, and no urinary symptoms. Night sweats had been profuse. He had lost twenty pounds in weight. There was nothing in the past history to throw any light on the present illness. His general health had always been good.

On admission his symptoms in order of importance were fever, sweating, and nausea. He looked chronically ill, and showed evidence of recent loss of weight. Positive findings were: equal expansion both sides of the chest, dulness over the right lower chest posteriorly up to the eighth intercostal space with diminished breathing, and tenderness on pressure over the ninth rib, dulness in the lower part of the right axilla with tenderness, rigidity with slight tenderness over the upper right rectus. Liver not definitely palpable. No definite gallbladder tenderness. Rest of abdomen negative. Spleen not felt.

On the basis of these findings the diagnosis was very doubtful. We observed him for several days and in the meantime had various laboratory tests made. General infections such as typhoid, endocarditis, malaria, and septicæmia were considered and ruled out. He ran a septic temperature, reaching 102.4° to 102.8° in the evenings and going down to 99° in the morning. His hæmoglobin was 68 per cent., red blood cells 4,220,000, white blood cells 11,750, polymorphonuclears 77 per cent., lymphocytes 16 per cent., eosinophiles 2 per cent., monocytes 5 per cent. The urine was negative except for a faint trace of albumen. The Wassermann was negative. An *x*-ray examination of the chest revealed clear, well aërated lung fields and clear costophrenic sulci. Neither side of the diaphragm showed very good excursion, and the right side was not out of proportion to the left, nor was there any abnormality in the position of either side of the diaphragm. The mediastinum was normal. The cardiac outlines were not perceptibly abnormal. A pericardial effusion could not be demonstrated. A few days later it

seemed to the röntgenologist that the right side of the diaphragm showed about 25 per cent. less excursion than the left one, and a belief was expressed that the patient had trouble in the right upper abdomen rather than in the chest.

Repeated physical examinations gave us the impression that the patient had some trouble in connection with the right diaphragm, probably suppurative in character, and that it was under, rather than over, the diaphragm. In trying to find an etiologic factor for such a process we were somewhat at a loss, because he had not had any inflammatory abdominal symptoms, nor a suppurative process anywhere else in his body. Amœbic liver abscess was considered, and questioning developed the fact that the patient had been in Chicago twice during the summer, but that he had not stopped at any hotel, and that he had not had diarrhœa.

Under the circumstances an exploratory operation was advised and it was performed February 3, 1934: Oblique incision in upper abdomen parallel to and about two inches below the costal margin. There was no free fluid in the abdomen. The liver was large and there were absolutely no adhesions. The gallbladder felt normal. On passing a hand over the dome of the liver a globular mass was felt within it. This same globular mass could be felt on the undersurface of the liver. It was very tense and gave the impression of containing fluid. There were a few changes in the liver tissue of the dome suggestive of a fibrosis of the liver overlying the tumor mass. The question of the proper place to incise the suspected liver abscess was carefully considered. It was accessible from the undersurface as well as from the dome. The latter was finally decided on because of less likelihood of spreading the infection into the peritoneum. A portion of rib was resected in the lateral chest wall corresponding to the region overlying the most prominent part of the liver swelling. About three inches of the eighth rib was resected up to the cartilage. On incising the rib bed the pleura was opened and was immediately sutured with continuous plain catgut which effectually closed it. The peritoneum was then opened for a distance of three inches, and the edges grasped with forceps and drawn out and everted to insure covering for the pleural suture.

Under the guidance of a hand introduced through the abdominal wound tampons were now inserted through the lateral wound in all directions to prevent spreading of pus to the subdiaphragmatic space or to the peritoneum. The laparotomy wound was then covered with pads and an exploratory puncture was done through the lateral wound into the swelling of the liver. Thick, nonodorous pus was obtained. A large trocar was inserted and 300 cubic centimetres of thick, hæmorrhagic pus evacuated. After withdrawing the trocar a suction apparatus was introduced through the opening and the remaining pus evacuated. Two drainage tubes were inserted into the liver abscess, and iodoform gauze packed around them. The gauze drains originally introduced were left in place. Wound left wide open. Abdomen closed in layers using continuous chromic catgut for the different layers and interrupted silk for the skin.

The patient reacted well from the operation, but in spite of the evacuation of the contents of the abscess and subsequent free drainage, temperature continued, usually reaching about 102° in the evening, but sometimes going to 103° and over. Irrigation of the cavity, and later removal of the tampons, did not improve the condition Drainage continued profuse and the pus was of the same pinkish color found at operation and contained broken-down material. Smear showed degenerated cells without organisms, and culture

was sterile. A search for amœba did not show sufficient definite evidence to permit a positive diagnosis. In spite of that carbosane (Lilly) was administered in doses of 0.25 gram, 20 capsules in all, without any effect on the temperature or the character of the discharge. Treatment with emetine hydrochloride was then started with most startling immediate results. The temperature promptly came down to normal and the discharge rapidly diminished and changed from a pinkish, thick, necrotic-looking pus to seropurulent material. Coincident with this there was a change in the appearance of the wound, and the patient's general condition improved. Emetine was continued for ten days, giving one grain a day. The patient was discharged cured March 17, 1934, forty-two days after operation. He has remained well.

The patient is presented to call attention to the interesting symptom-complex of fever, sweating, and nausea without practically any pain in a case of probable amœbic liver abscess; to the importance of tenderness over the lower ribs as a diagnostic sign, and to the striking result obtained by the use of emetine hydrochloride.

DIVERTICULUM OF THE ŒSOPHAGUS

Dr. Carl Eggers presented C. A., fifty-eight years old, first seen March 5, 1934, because of symptoms connected with the presence of an œsophageal diverticulum, having known of its presence for about eighteen years. The first symptoms had been cough associated with difficulty in swallowing. An *x*-ray examination at that time had shown the condition, but no operation had ever been considered, apparently due to lack of knowledge of the operability of a diverticulum. He would voluntarily regurgitate a certain period after eating in order to empty the pocket and thereby relieve the irritation and associated cough. Lately all the symptoms had become aggravated. They were particularly bad when he had a cold. His chief symptoms at present were difficulty in swallowing, regurgitation of food, cough, loss of weight and strength, loss of twenty pounds during the last three months, due partly to overwork, partly to a heavy cold, and partly to nutritional disturbances. He stated that he had good control over the diverticulum and could empty it at will. He felt that it was largely the increase in the size of the sac that was responsible for the aggravation of symptoms. During a meal food would enter the diverticulum until it was filled, and only then allow some to go down, but owing to the pressure or distortion produced by the weight of the filled sac, there was considerable difficulty for sufficient food to reach the stomach to nourish him properly.

The filled diverticulum always acted as an irritant, so that after a meal he had to regurgitate the contents and then use several glasses of water to thoroughly cleanse the sac. Especially at night did he resort to this treatment, in order to insure rest without coughing. There had never been any associated bad taste or odor from stagnation. He had never noticed a swelling in the neck. Five years ago he had a severe left-sided intrapulmonary lesion, apparently due to aspiration, which lasted about three months. There had been no *x*-ray examination since that time. His appetite was good, and there were no stomach symptoms. Except for the above there had never been any serious illness. Personal and family history were irrelevant.

The patient was a tall, undernourished, anæmic-looking man weighing 121½ pounds. He coughed a great deal which in connection with his history made one suspect bronchiectasis. His throat was negative, and there was no point of focal infection in his mouth. There was no glandular enlargement, no goitre, and no fullness in either supraclavicular fossa. He was able to

Fig. 1.—Large typical oesophageal diverticulum of 18 years duration.

Fig. 2.—Showing large diverticulum resting on skin of neck after first stage of operation.

Fig. 3.—Duodenal tube in oesophagus and patient swallowing barium to demonstrate a straight nonangulated oesophagus with no barium entering sac, though it had not yet been removed as shown in Fig. 2.

swallow water and then to regurgitate it without difficulty. It contained some food particles from his last meal. Nothing abnormal could be seen or felt in the neck during the act. Examination of the heart and lungs showed no gross abnormality. The abdomen was negative. Roentgenographic examination after injection of a barium mixture showed the outlines of a huge diverticulum, with its stoma at the usual site, on a level with the lower margin of the sixth cervical vertebra. From here it extended downward into the chest to the lower margin of the third dorsal vertebra (Fig. 1). A small amount of the barium was seen to pass down into the œsophagus. The films also indicated marked thickening of the lung root shadows with peribronchial infiltration extending downward.

Operation was decided on, to be done in two stages, and under ½ per cent novocaine local anæsthesia. *First stage March 16, 1934.*—A five-inch incision was made along the anterior border of the left sternocleidomastoid muscle extending down to the sternum. The muscle was retracted outward and the thyroid gland exposed. After ligating the inferior thyroid vessels and drawing the gland over towards the median line, it was possible by blunt dissection to work down to the diverticulum and to expose a small portion of it. The sac extended well down into the chest and it was only after considerable difficulty that it was drawn out and delivered into the wound. It was thoroughly freed of all coverings, taking care not to injure the recurrent laryngeal nerve. The nerve was not recognized during the operation. The sac was so large that it projected about two inches beyond the skin margins. There seemed to be no tendency for the sac to retract. It was therefore not sutured into the wound, but simply allowed to rest without any undue tension in order to avoid angulating the œsophagus. Vaseline strips were placed around it down into the depth and the upper part of the wound was then closed, using continuous plain catgut for the platysma and interrupted silk for the skin (Fig. 2).

The patient stood the operation very well. There was no pain, but considerable discomfort incident to the delivery of the sac. He coughed a great deal throughout the operation. During the following twenty-four hours the patient was not allowed to swallow anything, and when an attempt was made to give a little water it set up violent coughing, which was attributed to angulation of the œsophagus or to œdema of the parts. He expectorated a great deal. There was profuse serous drainage from the wound. His voice was husky, probably due to bruising of the nerve. Fluid had to be given by hypodermoclysis and proctoclysis. On the second day he was quite uncomfortable. He still coughed a great deal and he complained of distress in the neck. Inspection showed œdema and distention of the diverticulum. A few sutures and all vaseline strips were removed to relieve congestion and the sac was emptied by pressure of whatever air or fluid it contained. When later in the day he was still unable to swallow anything a small calibre stomach tube was passed through the nose. It promptly entered the diverticulum. With one finger in the wound, and another finger pressing on the tube in the diverticulum, it was guided down into the œsophagus and stomach. Regular feedings were then ordered, and from that time on he felt much better and his convalescence was uneventful. The tissues about the neck of the sac healed kindly.

Before proceeding with the second step of the operation it was decided to determine the position and patency of the œsophagus. It was realized that a change in the direction of the large sac from hanging downward into the chest to one at right angles to the œsophagus might easily produce serious

angulation. A thin barium mixture was therefore injected into the stomach tube to outline it, and after that the patient was asked to swallow a similar mixture. The Röntgen film showed a straight œsophagus and further showed that only a speck of the mixture entered the diverticulum (Fig. 3).

Second stage March 28, 1934.—The skin surrounding the neck of the sac was superficially infiltrated with ½ per cent novocaine. The outer wall of the neck of the sac was then incised flush with the skin of the neck. There were numerous bloodvessels in this wall which were individually clamped and ligated. The tissues were quite œdematous which facilitated separation of the layers. Clamps were applied to the edges of the outer coat, and by light traction on the sac and gentle dissection the two layers could be separated down to the entrance of the diverticulum into the œsophagus. Sac now removed, leaving a wide cuff of mucosa. With a finger in the neck of the sac the rubber tube in the œsophagus was easily palpable. Additional mucous membrane of the neck was now removed until there was a cuff about one-half inch wide. After freeing it well down to its junction with the œsophagus, it was gently inverted until it completely covered the opening. Vaseline gauze was packed onto this inverted mucosa to completely fill the canal of the outer layer. This part of the neck was now likewise liberated to allow retraction and aid in closure. Vaseline gauze was packed into the wound and it was left wide open. No sutures were placed. There was no pain connected with the entire procedure.

Feedings were continued through the tube for three days, when the throat irritation produced by its presence for thirteen days made its removal advisable. The patient swallowed quite well almost at once and rapidly improved. There was at no time any leakage from the neck of the diverticulum. The tampon was changed from time to time and the wound closed unusually quickly. Except for an inflammatory chest complication with temperature reaching to 101° and 102°, and a mild left-sided parotitis, the convalescence was satisfactory. He was discharged cured April 11, 1934, two weeks after the second stage. The pathologic diagnosis was: inflamed œsophageal diverticulum. The patient's voice remained husky for several weeks. Then it returned to normal quite suddenly. He is able to swallow normally. No instrumentation has been done. He is gaining weight and at present, about two months after admission, weighs twenty-seven pounds more than he did at that time.

Dr. DeWitt Stetten stated that he had been greatly interested in diverticula of the œsophagus since he saw his first case over twenty-five years ago. At that time the condition was supposed to be relatively rare, probably largely because the *x*-ray examination of the œsophagus had not yet been so thoroughly developed. Stimulated by his own case, he made a careful study of the subject, which he published under the title "The Radical Extirpation of Pharyngo-Œsophageal Pressure Diverticula" (Annals of Surgery, vol. 51, pp. 301–320, March, 1910). He found that up to that time only sixty cases had been reported, which had been radically operated upon. As far as he was able to discover, only one other case had been successfully operated on previously in New York City, by Dr. George E. Brewer, who presented the case before this society in 1908, just two years before Doctor Stetten's publication. Since Doctor Stetten's report, the condition has apparently become very much more common. The speaker had seen quite a number of cases,

assisted at several operations, and personally operated on two additional cases. He has never seen any, however, as huge as the one presented by Doctor Eggers. Doctor Eggers' patient, whom Doctor Stetten had the privilege of seeing before operation, was very much undernourished, and Doctor Eggers' result is certainly a brilliant achievement. In Doctor Stetten's first case, because the patient had difficulty in swallowing and because a bougie could not be passed, an original diagnosis of carcinoma of the œsophagus was made, and a gastrostomy performed. After the gastrostomy, the patient gradually improved and gained in weight, so that after sixteen months it was quite evident that an incorrect diagnosis had been made, and then only was an *x*-ray examination made, the diverticulum discovered, and removed. Based upon his success with the inadvertently performed gastrostomy, Doctor Stetten felt at that time that a preliminary gastrostomy in every case of radical extirpation of an œsophageal diverticulum was advisable, but from his subsequent experience, he believes now that this is unnecessary, except in very emaciated patients. He considers the two stage operation the safest procedure, as it is a fairly certain protection against anterior mediastinitis. The operation can be very readily done under local anæsthesia. In the case of a small diverticulum, he has tried not removing it at all, but just pulling it out of its position, changing its direction and turning it upward, and fixing it, with a fairly satisfactory result. Doctor Stetten emphasized the value of using the duodenal tube as an aid in the operation and after-treatment. He believes that it is a good idea to pass it before the first stage, as the patient can then be fed immediately through the tube, and after the second stage and the sac has been removed, swallowing movements, which may disturb the œsophageal suture line, can thus be avoided. Further, if there should be a leakage, the use of the tube will greatly facilitate healing of the fistula.

Dr. Franz Torek, referring to the question of the one and the two-stage operations, said that he thought both should be kept in mind. Neither the one nor the other should be discarded. In each special case one should make up his mind which to use. Thirty years ago the one-stage operation was very dangerous, the mortality being 20 per cent. Three or four years ago Lotheissen reported sixty cases done in five years by the one-stage method with only one death. When, in 1910, Charles Mayo brought out the two-stage method, this procedure was attended by a decided decline in the death rate, but, when surgeons became more familiar with the technic, the one-stage method became less and less dangerous, so that at present, in skillful hands, the advantage of the one over the other, as regards mortality, is practically eliminated. Zuskschwerdt did sixteen by the one-stage method without any failures, and Jackson of Philadelphia has his cases operated by the one-stage method. The speaker had always used the one-stage method without ill results. Surgeons should not adhere to just one method, but remember that there are two and that both are at their disposal.

RESECTION OF THORACIC PORTION OF ŒSOPHAGUS FOR CHRONIC ULCER

Dr. Carl Eggers presented Mr. A. McK., forty-seven years old, admitted to the Lenox Hill Hospital January 23, 1934, on account of difficulty in swallowing, which had begun about two or three weeks before. At first he was unable to swallow solids, but lately he also had difficulty with fluids including water. As a result he was losing weight rapidly. He had a sensation of food sticking at the lower end of the œsophagus. It would regurgitate soon after swallowing. There was no pain but he was troubled considerably with salivation.

He had never had any similar symptoms, but stated that he had been treated on and off for an ulcer of the stomach for the last three or four years. Three months ago he had developed an acute perforation and was operated on within a few hours at an hospital on Long Island. Inquiry at this institution revealed that he had had a large perforation at the anterior surface of the pylorus, which was closed by suture. No gastro-enterostomy had been done. Several days after operation he had had copious tarry stools evidently the result of bleeding from the margins of the perforated ulcer or from another ulcer. After several transfusions and other appropriate treatment he had recovered and had been discharged much improved. He had been well until the onset of his present symptoms.

The patient looked pale, chronically ill, and gave the impression of having lost weight recently. He weighed 138 pounds. General examination was essentially negative. The urine and blood were fairly normal. Röntgen-ray examination of the œsophagus after administration of a thin barium mixture revealed almost complete obstruction in the lower segment. Re-examination one half-hour after the meal showed most of the barium still in the œsophagus (Fig. 4). The lungs were negative for tuberculosis or metastases. On the basis of this examination the *x*-ray department reported probably cancerous involvement. An œsophagoscopy done the following day showed stiffening of the wall of the lower œsophagus with an almost annular ulcerative lesion fifteen and one-half inches from the teeth. A clinical diagnosis of carcinoma was made, but the biopsy specimen was reported chronic suppurative inflammation.

We were not convinced that we were dealing with a carcinoma, especially in view of the short history and the fact that he had been operated on three months ago for perforated pyloric ulcer. We considered the question of spasm of the cardia secondary to a persistent ulcer, as well as the diagnosis of so-called peptic ulcer of the œsophagus. Appropriate medication was given to relieve spasm and at the same time every effort was made to maintain his nutrition. In attempting to get a test meal we were unable to pass a stomach tube into the stomach but recovered 4 cubic centimeters of fluid from the lower œsophagus. It contained no free HCl, total acid 9, lactic acid negative, blood faint reaction, few epithelial, and pus and yeast cells. Wassermann examination was negative.

In spite of everything we did there was no improvement. A gastrostomy was therefore decided on, and was done January 29, 1934. The Janeway method was used and worked very satisfactorily. During the convalescence we again centred our attention on the question of diagnosis. The *x*-ray examination was repeated and again reported as an obstructive ulcerative lesion, probably carcinoma. On the theory that we might be dealing with a granuloma he was given a series of *x*-ray treatments without any relief. Instead of the obstruction lessening it seemed to become more complete. The

patient was unable to swallow anything. All food had to be given through the gastrostomy. The question of resection of the œsophagus was discussed. A third *x*-ray examination and a second œsophagoscopy again gave the clinical impression of carcinoma, but the biopsy was reported, "chronic inflammatory tissue, no definite evidence of malignancy." We felt we were dealing with a carcinoma, and were in favor of resecting the œsophagus, hoping that with a young patient and a short history the lesion might be removable.

Operation.—March 12, 1934. The patient was placed on the right side. An incision was made along almost the entire seventh intercostal space, and

FIG. 4.—Showing obstructive lesion at lower end of œsophagus with dilatation above.

carried upward over the seventh, sixth, fifth, and fourth ribs posteriorly. These ribs were then divided and the chest opened. The lung was so extensively adherent that it had to be separated before a rib spreader could be inserted. The adhesions also involved the diaphragm and the mediastinal surface, and made progress difficult. Finally the mediastinum was exposed and the overlying pleura incised. Several large lymph nodes were encountered and excised for examination.

The œsophagus was now exposed and by means of a tape passed under it gentle traction could be made which facilitated its separation. A tumor was felt within the œsophagus, beginning just above the diaphragm and extending upward about three inches. It had not involved the outer coat and therefore looked like a very favorable case. The question of resecting the œsophagus and bringing the stomach up into the chest for implantation was considered but given up because of the presence of the gastrostomy which

would probably interfere with the required thorough mobilization of the stomach, and also because the tumor extended too far up to make a safe implantation of the stump possible. A typical Torek operation was therefore decided on and was carried out with no change in any of the essential details. After dividing the œsophagus below the tumor and inverting the lower stump, the upper end was completely freed and brought out at the neck and the tumor then removed. Closed thoracic drainage was established and the chest wound then closed in layers. The patient stood the operation well. He was given a transfusion of 500 cubic centimeters whole blood as a precautionary measure.

The pathologic report of the specimen was of great interest. Though we had suspected an early carcinoma, it was reported, "chronic ulcer of the œsophagus and chronic lymphadenitis with anthracosis" (Fig. 5).

FIG. 5.—Specimen of resected œsophagus showing chronic ulcer surrounded by thick wall, producing almost complete obstruction. Upper œsophagus is dilated.

His convalescence was fairly smooth and uneventful without any respiratory distress. An *x*-ray taken the next day showed the lung fully expanded. Moderate drainage from the chest continued longer than usual and after discontinuing the drainage tube, an accumulation of fluid developed requiring reopening. In spite of the administration of fluids and other food through the gastrostomy as well as by proctoclysis, he lost considerable weight. There was no real improvement until normal feedings were started with the aid of a rubber œsophagus connecting the œsophageal stump and the gastrostomy tube. He now eats all soft and some solid foods. After thorough mastication he swallows his food and it passes down quite easily through his new œsophagus. If the food is thick an extra quantity of fluid is required to help it along.

The act of deglutition has sufficient force behind it to make fluid food pass into the stomach without difficulty, but with solid food there is occasional stagnation or even regurgitation. To overcome this, a mechanism has been devised by Dr. Alvin Dujat of our staff which adds a pressure bulb about the middle of the tube. If food stagnates the patient gently compresses his rubber œsophagus and by means of pressure on the bulb forces it down into the stomach. This mechanism has helped a great deal to make the patient's life more enjoyable as he is now able to eat almost anything (Fig. 6).

The reasons for presenting this patient are: (1) The rarity of successful œsophageal resections; and (2) to discuss the question of diagnosis of obstructive lesions of the œsophagus. In this particular case we were in doubt about the diagnosis of carcinoma because of the short history of obstruction and the preceding history of ulceration of the duodenum with perforation. We considered spasm secondary to ulcer as well as peptic œsophageal ulcer. However, after a certain period of observation, with increasing difficulty in swallowing in spite of the performance of a gastrostomy with the resultant rest of the œsophagus, and in spite of a course of *x*-ray

treatment, we gained the clinical impression that we were dealing with carcinoma. This was verified by three *x*-ray examinations and two œsophagoscopies. That the biopsies were reported negative was explained on the theory that it had not been possible to get a good piece of tissue. Similar experiences are not uncommon in our, as well as in other, hospitals. A negative biopsy proves nothing, whereas a positive one is conclusive. We have repeatedly seen patients pass into an inoperable stage because of a negative biopsy. It is therefore natural to want to make an early diagnosis, yet at the same time it is recognized that the gravity of the operation of resection makes it imperative to establish a correct diagnosis.

We operated with the clinical diagnosis of cancer. The question may well be raised whether that is justifiable. Would we, or should we, have performed such a serious operation had we known in advance that we were dealing with a chronic ulcer? A study of the available literature may help somewhat to answer two questions: (1) Is one justified in making a clinical diagnosis of cancer? (2) Is it permissible to resect the œsophagus for a benign lesion?

FIG. 6.—Showing patient with his rubber œsophagus in which has been inserted a rubber bulb to facilitate the passage of semi-solid foods.

The patient had all the characteristic symptoms of carcinoma, such as insidious onset of difficulty with swallowing, at first pertaining to solid food only, but later also to fluids. There was no pain. There was no history of injury or of swallowing of irritating substances. He was losing weight. The diagnosis of carcinoma was clinically verified by *x*-ray and œsophagoscopical examination. The outstanding feature was obstruction. The literature on the subject tells us that with simple or peptic ulcer the outstanding symptoms usually are similar to those of gastric ulcer, and consist of pain, hyperacidity, *etc.* The *x*-ray examination is often entirely negative. Through the œsophagoscope the ulcer appears to be flat, usually small, and does not encircle the lumen. Obstruction is a late manifestation. With the present state of our knowledge it therefore seems justifiable to make a clinical diagnosis of cancer in a lesion which is primarily obstructive, and which on repeated examinations impresses one as a carcinoma.

The second question, whether it is permissible to resect the œsophagus for a lesion known to be benign, is not easy to answer. There are many points to be considered. As far as I know this is the first case in which resection was done for simple ulcer. We therefore have nothing to guide us. It is known that the operation of resection is a serious one in older patients afflicted with carcinoma. Experience may show that it is not nearly so serious in a younger patient with a simple ulcer. If it were an established fact that simple ulcer is a rather harmless affliction, the answer would be easy. One might easily apply local application to the ulcer through an œsophagoscope and perhaps do a Janeway gastrostomy for feeding and to put the œsophagus at rest. The literature, however, speaks of a great number of cases of simple ulcer which end fatally, on account of perforation. As a matter of fact, most of our knowledge of simple or peptic ulcer of the œsophagus has been obtained at the autopsy table. Under these circumstances it may be permissible at times to deliberately plan resection of the œsophagus for chronic ulcer in the hope of avoiding long-drawn-out local treatments which are not without danger and also possibly avoiding perforation. Much more knowledge of this condition will have to be acquired before definite conclusions can be reached.

Dr. Franz Torek stated that this case was very interesting inasmuch as it opened a new method of treating a nonmalignant lesion in the lower portion of the œsophagus. Ulcers of the œsophagus, whether peptic or varicose, have at times resisted all conservative treatment, and continued bleeding or perforation of the ulcer has caused the patients' deaths. In this case, although the treatment resorted to was on the basis of a wrong diagnosis, one may conclude that it would have been a wise choice, even if the correct diagnosis had been made, as it is the only radical method of treatment for these ulcerative processes at the lower end of the œsophagus.

ANEURYSMORRHAPHY FOR ARTERIOVENOUS ANEURYSM OF THE POPLITEAL VESSELS

Dr. Harold Neuhof presented a man, thirty-five years old, Mount Sinai Hospital, No. 361,611, who was admitted January 16, 1934, with previously negative history. He sustained a bullet wound in the right knee about two and three-quarter years ago. The bullet entered the back of the knee and emerged at the mesial side of the patella. A swelling behind the knee was noted. From the time of the accident the swelling was found to be pulsating with a "purring" sensation to touch. The "purring" sensation was sometimes felt along the thigh as high as the inguinal region. The primary treatment was immobilization in plaster for a period of six weeks. After the removal of the plaster the swelling was noted to be of about the same size as originally noted. Stiffness of the knee on moderate flexion was observed after the plaster was removed. This stiffness did not improve and one year after the accident an operation was performed for its relief. Appreciable improvement was not noted. Swelling of the leg, chiefly at the ankle, was frequently present. From time to time the patient experienced paræsthesia in the foot and lower lateral aspect of the calf. Precordial distress was occasionally noted. The general condition has remained satisfactory and there have been no symptoms other than the occasional precordial manifestations and a sensation of difficulty in breathing. The treatment which had been administered since the removal of the plaster splint has been ultraviolet light and baking.

On general examination, some enlargement of the heart was noted. A harsh systolic murmur was heard over the entire precordium together with an occasional presystolic roughening at the apex. Upon pressure over the popliteal aneurysm, sufficient to obliterate the pulsation, all murmurs disappeared. Furthermore, the heart-rate, 88 to the minute before compression, dropped abruptly to 50 beats per minute after compression. The right leg appeared warmer than the left and greatly dilated veins were to be seen up to the knee-joint. There was a characteristic fullness in the right popliteal fossa with typical expansile pulsation and a continuous thrill more marked in systole. The aneurysm appeared to be about 5 centimeters in vertical and transverse diameters. Its anteroposterior diameter could not be determined because of the diffuseness of the swelling. A systolic and faint diastolic thrill were also felt over the right femoral artery. Compression of the popliteal aneurism obliterated the femoral thrill. A marked and continuous to and fro whirring bruit was audible over the popliteal swelling and was audible although less marked over the course of the whole femoral artery. The systolic bruit was also audible to a lesser extent over the calf. Neither dorsalis pedis nor posterior tibial arteries were to be felt at the right ankle.

In addition to the fall in pulse rate upon pressure over the aneurysm or upon pressure of 200 millimeters of mercury over the right thigh, the patient experienced a sensation of marked relief as though a heavy weight over the precordium was lifted. He also noted somewhat freer and easier breathing. These compression studies, with some modifications, which will not be detailed, were repeated upon a number of occasions. The two most striking features among the observations which were made before operation were found in the röntgenogram of the chest and in the circulation time. The röntgenogram revealed a hypertrophy with moderate dilatation of both sides of the heart, and, of greater interest, an exaggeration of the pulmonary markings indicative of engorgement of the pulmonary circulation. The circulation time was greatly prolonged, being twenty-eight seconds upon different occasions.

Operation was performed on January 23, 1934. An Esmarch bandage was applied. A vertical incision was made over the aneurysm. The popliteal nerves made a bundle surrounded by greatly distended veins. The popliteal vein entering the aneurysm was enormously dilated. The aneurysmal sac, which was exposed on its posterior and lateral aspects, appeared to communicate with the vein alone, the arterial communication not being discernible at this stage. The sac was freely incised and blood welled up in large quantities. The orifices of the upper and lower venous openings into the sac were plugged by the assistant's fingers. At this stage it was obvious that the popliteal vein required ligation outside the sac and it was severed between ligatures directly adjacent to the aneurysmal sac. The site of severance could be placed just below a large branch which extended downward and mesially across the popliteal space. Bleeding from the venous orifices was not controlled until their mouths were shut off by sutures (linen) placed from within. After bleeding from the venous mouths was controlled, the interior of the sac could be inspected. It was smooth, irregular, with some fibrous thickening of the wall. On the floor of the sac the arterial communication was seen. This was found to be not the main trunk of the popliteal artery, but an arterial branch of fair size. Its mouth was shut off from within the sac by a suture (linen). The floor of the sac was then obliterated by a layer of interrupted linen thread sutures. Over this two additional mattress layers (linen) were superimposed.

The Esmarch bandage was then removed and the exact nature of the

lesion could be appreciated. The popliteal artery was intact and did not enter the aneurysm. There was one additional arterial branch entering the sac which had not been shut off, and this was separately secured by suture. Other than the observation of an intact popliteal artery, the most significant feature following the removal of the Esmarch bandage was a large sciatic artery whose expansile pulsations could be felt within the group of nerve bundles. It was undoubtedly an important factor in the maintenance of the blood supply to the leg inasmuch as the popliteal artery itself probably emptied its blood into the aneurysm *via* the communicating branches. If all of the blood of the popliteal artery did not enter the aneurysm, most of it must have done so, otherwise pulses would have been felt at the ankle and the great dilatation of the sciatic artery would not have occurred. The sensory disturbances in the foot and calf which existed before operation were probably referable to compression by the dilated sciatic artery.

In view of the fact that a through circulation *via* the popliteal artery would be present after operation, one could assume immediate return of the dorsalis pedis and posterior tibial pulses. It was also felt that one could anticipate rapid return of normal circulation time as well as disappearance of heart murmurs and reduction in size of the heart. Full pulsation in the arteries at the ankle was noted directly after operation and these pulses have remained throughout the hospital stay and subsequently. No cardiac murmurs were to be heard the day after operation. The circulation time was tested the day after operation and was found to be thirteen and one-half seconds, that is, a circulation rate within normal limits. A week later it was again tested twice and found to be twelve and fourteen seconds respectively. One week after operation a röntgenogram of the chest showed a distinct decrease in the size of the heart and in addition much less engorgement in the pulmonary vessels. Two weeks later another film of the chest was made and showed that the heart had undergone further and distinct recession. Precordial distress disappeared shortly after operation and has not recurred. The bruit disappeared and has not returned. A full pulsation of the popliteal artery is felt in the popliteal space and this is superficially placed because of the flexion fixation of the knee. The engorgement of the veins in the leg disappeared soon after operation. There was also noted some improvement in the range of motion at the knee-joint although the range remains greatly limited and there is an inability to fully extend the knee.

The features in this case worthy of comment are: (1) the aneurysm only consisted of branches of the popliteal artery communicating with the popliteal vein; (2) the presence not only of an enlarged heart but also of engorgement of the pulmonary circulation with rapid recession of both after operation; (3) the marked dilatation of the sciatic artery as a collateral blood carrier; (4) the actual demonstration of great retardation in circulation time as a result of the arteriovenous aneurysm, with immediate return of normal circulation time after operation. (As far as I am aware, this is the first time that alterations in circulation time have been demonstrated in arteriovenous aneurysm.) (5) A completely satisfactory result following obliterative endoaneurysmorrhaphy.

PERICARDIECTOMY FOR ADHESIVE PERICARDIUM

Dr. Harold Neuhof presented a man, thirty-nine years old, admitted to Mount Sinai Hospital (Chart No. 328,627) in July, 1931. Dyspnœa, substernal oppression, and weakness began insidiously six months before, and were progressive. Dyspnœa and weakness were the chief complaints on admission. On examination the heart was found enlarged, extending to the

anterior axillary line on the left side, and 2 centimeters to the right of the sternum on the right side. There were moist râles over both bases. The firm, enlarged liver extended downward 8 centimeters below the costal margin. The blood-pressure was 126/70. The röntgenograms of the chest demonstrated the greatly enlarged cardiac shadow and revealed infiltrations in the lower lobes and some evidence of bilateral pleural effusion. The ECG revealed a tendency to left ventricular preponderance, inversion of T1 and T2, low T3, and low voltage suggestive of coronary artery disease and myocardial damage. During a period of five months the treatment which was instituted was that for heart disease. Large bilateral pleural effusions appeared. These were repeatedly tapped, and aspirations were followed by early recurrences. The liver enlarged further under observation. A pulsus paradoxicus appeared. Ascites developed and was progressive, requiring tapping. Icterus appeared. There was increasing œdema of the extremities. Dyspnœa, cyanosis, and asthenia became more marked. Salyrgan proved effective in eliminating large amounts of fluid upon a number of occasions. Some fever and a moderate leukocytosis were present in the first weeks, but subsequently subsided. The heart-sounds, which were rather distant on admission, became more distant and weak, and gallop rhythm appeared. In the latter stages of the period of observation and medical treatment, which was of five months' duration, the pulses became progressively smaller, the blood pressure gradually dropped to 98/80, and the patient was bed-ridden. When, in addition to the evolution of the manifestations which have been outlined, repeated venous pressure estimations revealed a persistently elevated pressure (15 to 20 centimeters) a diagnosis of adhesive pericarditis appeared justified. The inefficacy of therapy in a case in which the manifestations developed under observation, and the progression of symptoms, warranted an effort at operative relief.

At operation, November 20, 1931, under avertin anæsthesia, a large left-sided musculocutaneous flap was reflected laterally, exposing the middle group of costal cartilages. Sections of the third, fourth, fifth, and sixth were subperichondrally excised. The anterior mediastinum was then entered and the internal mammary vessels were secured above and below. Approximately the left half of the sternum at the site of excision of the costal cartilages was removed with rongeurs. Only thin adhesions were present down to the pericardium. The case was therefore not one of mediastinopericarditis. The left pleural reflection was stripped away laterally. There now presented the almost immobile pericardium with whitish and resistant surface. By retraction of the sternum and of the lateral flap adequate exposure for subsequent manipulations was obtained. The dense, presenting membrane was first incised in the left lateral aspect of the exposure, presumably over the left ventricle. A vertical incision was made through this avascular and fibrous tissue and was deepened for one-half an inch until there presented in the widening gap the pulsating surface of the heart. The membrane was now freely incised upwards and downwards and separated along a plane of cleavage that could be readily followed. A progressively larger area of the heart presented in the cleft that was made. Excision of the membrane was then begun. This was first carried out laterally with the idea of first freeing the left ventricle. In the depths of the lateral dissection the pleural reflection could not be stripped away and the pleura was therefore entered and packed off. When the dissection had been carried beyond the left border of the heart the membrane that had been freed, about three inches in each diameter, was excised. It was found to be about half an inch in thickness and to consist of two layers of fibrous tissue separated by a softer intervening layer. As

the result of the removal of this portion of the membrane the heart was considerably released over its left lateral aspect. A similar dissection was then begun to the right and about the same amount of tissue was again excised in one piece. The result of this wide removal of the membrane was a partial release of the heart, which came up into the gap that had been made and pulsated with considerable force. It was, however, still encased by an additional smooth, whitish layer of tissue and obviously an additional procedure for further release was required. Accordingly, this layer was cautiously incised first over the left ventricle. It was well defined, avascular, and one-eighth to one-quarter of an inch in thickness. There was no absolute line of cleavage between it and the heart musculature, although for the most part a definite plane of cleavage existed. The true release of the heart occurred as this layer was removed. The heart herniated through the gap and, in fact, its rapidly increasing protrusion made the dissection over the right aspect of the heart more difficult. The cardiac musculature was not of normal appearance, being rather grayish in color. The coronary vessels were not seen and there was only a suggestion of the groove between the right and the left heart. After this layer had been widely removed an incision through it was made at the extreme right of the operative exposure. This resulted in the release of more of what was assumed to be the right ventricle. Neither auricle could be identified as such. The release over the anterior aspect of the heart being apparently adequate for the herniation of the organ, dissection of the inner confining layer was now carried downward around the apex. The latter was thereby released, was lifted out of its bed, and further dissection of the inner layer was carried out behind the apex and over the posterior surface of the heart. On the right side this was continued until the region of the inferior vena cava was reached. There were no adhesions in this region and the vena cava was not seen. After the release of the posterior aspect of the heart, the remains of the thickened pericardium, which extended down to the diaphragm as a stiff ridge, was widely excised with barely any bleeding.

Although the right auricle and the vena cava were not seen the impression that was gained was that a true release of the heart had been obtained from the membranes which confined it. It seemed that this should suffice despite a prevailing view that release of the right auricle and cava is imperative if a satisfactory result is to be anticipated. Accordingly no further releasing efforts were attempted. The heart lay in the anterior part of the operative exposure close to the musculocutaneous flap which was now drawn and sutured into position.

During operation, blood pressure observations were made at very frequent intervals. The blood pressure only rose definitively after the inner confining layer, presumably altered epicardium, was removed. It was 98/80 at the beginning of operation and rose to 120/90 at that stage. Frequent extrasystoles were noted. As the heart release occurred it was further noted that the fingers and lips became less cyanosed and the pulse fuller. The pulse rate, which was 76 at the beginning of the one and three-quarter hour operation, rose to 104 at the end of operation.

The immediate postoperative course was satisfactory. In order to relieve the strain on the heart, the right chest was aspirated the fourth day after operation and 800 cubic centimetres of fluid was withdrawn. The left chest was emptied of considerable fluid a few days later. Only one subsequent aspiration of the left chest was performed. There was progressive improvement in the condition of the patient, which was obvious ten days after operation. The note of that day: As compared with the condition before operation, cyanosis is very much less marked. The pulses are of fuller

volume. There is no engorgement of the neck veins. Jaundice is gone or almost gone. There is no dyspnœa even on exertion or on sitting up. The free border of the enlarged liver has receded.

Six weeks later the progressive improvement which had occurred was especially noted. The patient had been up and about for a few weeks. Ascites and peripheral œdema had disappeared. Venous pressures were progressively lower. The patient was discharged from the hospital and further improvement since that time has been noted. About six months after operation the patient was quite symptom-free. The liver was no longer palpable, the pleural cavities were free of fluid, and there were no ascites or œdema. There was progressive increase in weight and strength. One year and one-quarter after operation the patient was readmitted to the hospital for study. He was symptom-free. There was no dyspnœa or orthopnœa on ordinary exertion. The liver was not palpable. There was no peripheral œdema. There was no engorgement of the cervical veins. The venous pressures at two readings were 5½ centimeters on one occasion and 6½ centimeters on another. All the signs of cardiac failure had disappeared. The ECG showed a slight improvement but was still abnormal. The T1 was actually inverted and T2 and T3 were low. The voltage was low throughout. Another venous pressure estimation done early this year (1934) showed a pressure of 4½ centimeters. The general condition has remained excellent, the patient has been able to work. He is symptom-free and the most recent röntgenogram taken in March of this year shows that the configuration of the heart is practically normal.

Dr. Howard Lilienthal said he had done only two of these operations and both were unsatisfactory, but it should be mentioned that conditions were such that they could not be carried out as Doctor Neuhof had done. In one there was a large quantity of pus in a space between the pericardium and epicardium. The latter membrane was calcified as well as the pericardium itself.

TRANSACTIONS

OF THE

PHILADELPHIA ACADEMY OF SURGERY

STATED MEETING HELD APRIL 2, 1934

The President, Dr. Walter E. Lee, in the Chair,
Calvin M. Smyth, Jr., M.D., Recorder

SPONTANEOUS INTRAPERITONEAL RUPTURE OF THE GALLBLADDER IN A CHILD

Dr. Richard H. Meade, Jr., reported the case of a thirteen year old boy, admitted to the Episcopal Hospital in the service of Doctor Mutschler, complaining of pain in the right half of his abdomen. This pain had started three days previously, following a cold of three days' duration. Family and past history were negative. Examination showed râles at the base of the left lung; the right upper quadrant of the abdomen was rigid and tender; temperature 100°, pulse 88, respirations 28, leukocytes 9,000. Diagnosis of acute appendicitis with the appendix in a high position was made in spite of the objective evidence of an acute cholecystitis, because of the patient's age and absence of previous symptoms of gallbladder disease. At operation under spinal and nitrous oxide-oxygen anesthesia, a considerable amount of clear peritoneal fluid was encountered, the appendix showed slight inflammation of its tip, but the gallbladder was found to be greatly distended, lightly adherent to surrounding structures and its wall thickened and edematous. Aspiration of the gallbladder gave clear fluid followed by thin pus, which was in turn followed by clear dark bile. Cholecystostomy and appendectomy were done. The postoperative course was marked by bronchopneumonia during the first week, and by a slight wound infection, but the patient was discharged in good condition with the wound entirely healed January 25. All drainage had stopped three days previously. Culture of the peritoneal fluid was negative, but the bile showed *B. escherichia alcolescens.* The appendix showed a slight degree of chronic inflammation.

The patient remained in good health until February 11, 1933, seventeen days after his discharge from the hospital. At this time, after a hurried lunch, he was suddenly seized with sharp right upper abdominal pain. He came at once to the hospital and vomited en route. Pain radiated to the back and the right shoulder. In the receiving ward he was thought to be suffering from acute indigestion, and securing prompt relief from gastric lavage, he was allowed to go home. Here he vomited on arrival and had a return of his pain. The pain persisted and fever developed. On his return to the hospital two days later, he was obviously very sick, with bulging

and marked tenderness of his right upper abdomen and lower right chest, with physical and *x*-ray evidence of high fixation of the right dome of his diaphragm. Temperature 101°, pulse 120, respirations 48, leukocytes 40,000. Diagnosis of subdiaphragmatic and subhepatic abscess secondary to previous gallbladder infection was made. Operation was performed as soon as possible under local and nitrous oxide-oxygen anesthesia. The peritoneal cavity was entered through an incision extending laterally from the original paramedian incision. There was a sudden outpouring of a large amount of normal looking bile, which apparently surrounded most of the right lobe of the liver, and was walled off in the right upper quadrant of the peritoneal cavity by adhesions which had developed during the first illness. The gallbladder could be felt to be in a collapsed state and its wall seemed to be soft and not thickened. A small bean-shaped stone seemed to be present within the gallbladder. Due to the patient's condition, further exploration was thought to be inadvisable, and the abdominal wall was closed around a large cigarette drain which had been placed down to the gallbladder. His postoperative course was again marked by a short period of bronchopneumonia involving the left lung, during the first week, but was otherwise uneventful. Drainage was profuse at first, but gradually decreased, and had entirely stopped by March 16. On this date the patient was discharged in excellent condition and with his wound healed. Culture of the bile at the time of this last operation showed the same organism that had been found on the first admission. Since his last discharge the patient has been free from all symptoms, although cholecystographic studies done July 14, 1933, showed evidence of a nonfunctioning gallbladder.

The speaker remarked that gallbladder disease is no longer thought to be limited to patients of mature years. Its occurrence in children has been drawn to the attention of the profession by an increasing number of reports, and yet the age factor continues to play an important rôle in our differential diagnoses. The foregoing case illustrates this point. It is presented, however, mainly because of the unusual sequel of spontaneous rupture of the gallbladder following its apparent healing. The cause of the rupture of the gallbladder in this case was probably due to the rapid overdistention of the weakened gallbladder as a result of disturbance of the muscular mechanism of the duodenum at the entrance of the common duct, and an increase in bile flow in response to the dietary indiscretion which immediately preceded the second illness. The evidence of gastric dilatation as found in the quick relief of symptoms following gastric lavage seems to support this hypothesis.

SPLENECTOMY AND CHOLECYSTECTOMY

IN TWO CASES OF SPLENOMEGALY WITH JAUNDICE AND CHOLELITHIASIS

DRS. HUBLEY R. OWEN and J. P. NORTH remarked that when disease is present in two organs simultaneously attention is apt to be centered upon that viscus which gives rise to the more conspicuous symptoms. Thus, in

coexistent cholelithiasis and hemolytic icterus, the associated and often symptomless gallbladder disease may be overlooked. This coexistence has been marked upon by many authors (Boyd, Balfour, Pool). Pemberton,[1] in a review of The Mayo Clinic series of splenectomies for hemolytic jaundice, observed conclusive evidence of gallbladder disease, with or without stones, in 68 per cent. In spite of this, the advice of Moynihan is not often followed by operating surgeons. Moynihan[2] states that "no operation for hemolytic icterus is complete until the bile passages have been thoroughly explored." Where both diseases are found, a rational treatment would seem to be splenectomy and cholecystectomy, in either one or two operations.

In two cases to be reported herein, splenomegaly and jaundice were present together with cholelithiasis. In each case splenectomy and cholecystectomy were performed. In the first patient the operation was performed in two stages; in the second, the operation was accomplished in one stage. The first patient presented difficulties in classification. Many features of acquired hemolytic icterus were present. However, blood cell fragility was within normal limits. The pathologist described the spleen as characteristic of the preascitic stage of Banti's disease. Since Thompson[3] and others believe that, in the true hemolytic icterus, the microscopic pathology of the spleen is distinctive, the case herein reported can be designated only as hepato-lienal disease with anemia. The spleen in the second case presented no such difficulties in classification as a true hemolytic icterus. In neither patient could a familial history of jaundice be elicited.

CASE I.—W. D., male, 24 years old, in September and again in December, 1932, had attacks of epigastric pain with massive hematemesis but without jaundice. He first developed jaundice in January, 1933. This attack was painless but was accompanied with malaise and weakness. He was referred from the Medical Service of Dr. Robert Torrey, at the Philadelphia General Hospital. Examination revealed a greatly enlarged spleen. The laboratory examinations revealed erythrocytes 3,300,000; leukocytes 2,400; hemoglobin 70 per cent; platelets 120,000; reticulocytes 1 per cent. Bleeding and coagulation time normal. Hemolysis of red cells began at .42 and was complete at .32. There was an indirect van den Bergh reaction and icterus index of 65. Urine contained both bile pigment and salts.

After three weeks in the hospital there was improvement with icteric index decreasing to 35. Splenectomy was performed February 6, 1933, by Doctor Owen, under ether anesthesia. There were extensive perisplenic adhesions. The liver was somewhat enlarged but its surface appeared normal. Stones were palpated in the gallbladder. Convalescence was complicated by pulmonary atelectasis. The jaundice gradually receded and after four weeks the icteric index was 18. The blood picture did not greatly change save for a persistent postoperative leukocytosis of 12,000 to 17,000, platelets 180,000.

Six and a half weeks after splenectomy, the gallbladder was removed under ether anesthesia. No stones could be palpated in the ducts. Again pulmonary atelectasis complicated the recovery. The patient was discharged April 3, 1933. There have been no further hemorrhages. No jaundice has been perceptible and at present (fourteen months after operation), the icteric index is 7. His blood shows: erythrocytes 4,350,000; leukocytes 8,300; hemoglobin 90 per cent; platelets 410,000.

The pathologist (Dr. Philip Custer) described the spleen as typical of the preascitic stage of Banti's disease (the clinical picture was not that of Banti's). The conspicuous microscopic changes were follicular hyperplasia, and an increase in stroma, the rigidity of the latter preventing collapse of the sinusoids which remained widely open and filled with blood.

CASE II.—M. W., female, aged 29. Seven years ago the patient had an attack of intense epigastric pain associated with jaundice for a week. There was no further jaundice noticed until shortly before she entered the Jefferson Hospital. She presented herself not because of the jaundice but for a red papular eruption on the body. This skin lesion, presumably purpuric, had appeared on six occasions during the past year. Examination showed a palpably enlarged spleen. The erythrocytes were 3,000,000; hemoglobin 60 per cent; leukocytes 12,000. Hemolysis of the red cells began at .50 and was complete at .40. There was an indirect van den Bergh of 2.8 units and icteric index of 25. Urobilinogen was present in the urine. Cholecystogram was reported as showing a poorly functioning gallbladder with stones.

While in the hospital anemia was progressive and there was an increasing leukocytosis. The patient had several attacks in which she became very weak and faint, accompanied by cold sweats. She was given two small blood transfusions which were followed by severe reactions with increase in anemia and deepening of jaundice. The van den Bergh increased to 4.5 units. On one occasion blood smears showed microcytosis and 4 per cent reticulocytes.

On February 1, 1934, an adherent spleen was removed under gas-ether anesthesia. The gallbladder wall was thickened and there were many calculi but none were palpated in the ducts. Cholecystectomy was performed. Convalescence was uneventful. There was an immediate leukocytic response to 55,000. Erythrocytes and platelets increased gradually until at discharge there were 1,500,000 platelets and 4,400,000 erythrocytes. The fragility of the red cells and the van den Bergh had returned to normal. Two months after operation the patient is in good health and free from jaundice. Erythrocytes are now 5,160,000 with 92 per cent hemoglobin and 31,600 leukocytes, blood platelets 684,000.

Microscopic sections of the spleen showed some thickening of the capsule and a striking hyperplasia of the sinusoids. The latter were distended with blood. The follicles were not increased in number and those present appeared essentially normal. There were many thick hyalinized connective tissue strands scattered thoughout the tissue.

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[2] Moynihan, Berkeley: The Spleen and Its Diseases. London, 1921, p. 95.
[3] Thompson, W. P.: Bull. Johns Hopkins Hosp., vol. 51, p. 365, 1932 (*et seq.*).

CHOLEDOCHUS CYST WITH A DOUBLE COMMON BILE DUCT

DRS. WILLIAM B. SWARTLEY and S. DANA WEEDER read a paper with the above title for which see page 912.

ACUTE CHOLECYSTITIS

DR. BENJAMIN LIPSHUTZ read a paper with the above title for which see page 902.

DR. DAMON B. PFEIFFER said that the profession is now focussing its attention upon this important matter of immediate *versus* delayed operation in the case of acute cholecystitis and upon the correct solution will depend many lives. His feeling, therefore, is one of great caution but of open mind. There are no available statistics to throw definite light on the situation. Medical statistics are notoriously lacking in value. The few small series so far published present many variables which entirely invalidate sweeping conclusions and the speaker did not believe that any set of statistics gathered from existing records will settle the matter. Many surgeons speak of immediate operation, meaning that they operate promptly on admission of the patient to the hospital. In the protocol you find that the patient has already been sick several days. In spite of this fact these surgeons are apt to speak as though they are employing a policy similar to that which the profession has worked out in appendicitis. Actually, hospitals and surgeons see but few of the cases of acute cholecystitis occurring in general practice. The practitioner has not been educated to believe that an acute gallbladder is excessively dangerous. He treats such cases expectantly. The vast majority subside without perforation or gangrene, as every one knows—a situation quite different from that in appendicitis. A certain proportion, however, do fail to improve and either as a result of pressure from the patient or the physician's apprehensions, they are sent to the hospital, arriving, as before stated, two or more days after the attack has begun. Since these are presumably the serious group of cases containing within their numbers a certain proportion of actual or potential perforations or gangrene, they cannot be made subject to a general rule of waiting. That must be conceded. On the other hand, there are in this group a majority, in the speaker's experience a large majority, who under a few days' careful treatment will improve greatly in their general condition, will not perforate or become gangrenous, and can be operated upon more safely in the descending phase of the attack when they are already getting the upper hand of the infection, when the heart, kidneys and other vital organs have been brought into a better condition, a state of affairs

urgently demanded in many instances, since gallbladder disease, unlike that of the appendix, usually comes to our hospitals ensconced in the old, the fat, the debilitated, the organically damaged. It has been the speaker's practice to try to differentiate between these two groups, considering it equally unwise to operate upon the patient in bad general condition but whose gallbladder is not at the time a source of danger to the general peritoneum, as to fail to realize that the risk of operation must be undertaken in other cases because of the severity of the local disease, its probable course and the possible existence of complications such as pancreatitis. This plan seems to be working out satisfactorily.

In a group of 150 cases analyzed recently in the Abington Memorial Hospital, thirty-five patients were of the acute type of disease. The total mortality was five. Two of the deaths occurred in the acute group; one a woman in her eighty-sixth year, who came in with a perforated gallbladder and local peritonitis. A cholecystostomy under local anesthesia was done and she was apparently recovering but died of a sudden heart attack on the third day. The policy in this case was correct. Heart disease had been present many years. The second patient was allowed to subside into the improving stage, was operated upon six days after admission, having previously been sick several days, made a perfect postoperative recovery for the first two weeks, then became feverish and died later of concealed infection which we were unable to locate as no autopsy was permitted.

The speaker believes it is usually possible to recognize gangrene and impending perforation by the symptomatology. The most important sign is tenderness. The exudate from a gangrenous gallbladder is intensely irritating to the peritoneum and there will be spasm, rigidity, and superficial tenderness as of the inflamed peritoneum which may be differentiated from the deeper tenderness due to an inflamed but intact gallbladder. All this requires experience, but what is there in surgery that does not? You cannot make rules that will enable the tyro to be successful.

The speaker shuddered to think of acute gallbladder cases being treated as emergencies whenever and wherever they may be. It seems that many disasters will follow. On the other hand it is clear that there is a very important percentage of mortality in gallbladder disease due to delay in operation. Acute cholecystitis is not a medical disease. Its risks are too great to be entrusted solely to the care of those without special experience in abdominal catastrophes. More cases should be operated upon early in the acute stage than has been the case in the past. It is still, however, the speaker's belief that a brief period of observation to determine the trend of events which may be utilized for preparation of the patient and assessing his general condition is advantageous. The ultrasevere cases should as a rule be operated upon without unnecessary delay. The remainder of the acute group, in Doctor Pfeiffer's opinion, may still more advantageously

be conducted into a period of initial improvement before the operation is done. It is not wise to delay until complete subsidence has occurred.

Dr. Charles Mitchell agreed with Doctor Pfeiffer, and said that nearly every case he had had some complication and in nine out of ten he waited. The majority of cases he sees now are four to seven days old.

Dr. Hubley R. Owen said it is somewhat difficult to estimate the meaning of "emergency operation." Doctor Lipshutz states that a clinical survey was made in these cases. If a clinical survey necessitates three or four days' duration, then in the speaker's opinion an operation at the termination of that time should not be designated "an emergency operation." He has always waited in these cases for liver function test, administration of glucose in the presence of a damaged liver and electrocardiographic study. The speaker does not favor rushing in to operate upon these cases until after these data have been obtained.

Dr. Louis D. Englerth agreed with Doctors Owen and Pfeiffer. He was unable to state accurately the mortality in his cases. Most of the cases of acute cholecystitis that he sees have usually been ill for a period of from four to five days. He often practices waiting several days in getting these patients in condition for operation. At times the subserous edema about the gallbladder bed and ducts gives the operator a line of cleavage which renders the technical removal of the diseased organ rather easy. Using this observation a as clue the speaker artificially creates such an edema by injecting, with a fine needle, a small amount of sterile salt solution about the cystic duct and the gallbladder bed. The ballooning up of these tissues facilitates subsequent cholecystectomy.

Dr. Henry P. Brown, Jr., said that aside from the cases in which perforation of the gallbladder is obvious and these are rare, one can well afford to observe these patients for a few hours, and if they tend to improve, continue expectant treatment. If they do not show improvement in eight to ten hours, then surgical interference will in most cases be indicated. Meanwhile fluids can be administered as required. In his experience, cholecystectomy of the acutely inflamed gallbladder usually offers less technical difficulty than in the chronic cases, as the edema of the tissues about the acutely inflamed gallbladder affords a ready plane of cleavage.

Dr. Calvin M. Smyth, Jr., said that it is true that gangrene and perforation both occasionally occur in acute cholecystitis. However, they are uncommon, if not actually rare. Personally, he has always felt that these patients could be operated upon with much less risk if given an opportunity

to subside. The best index of subsidence is the return of the temperature to normal and a decrease in the amount of pain and tenderness. Like Doctor Pfeiffer, he has never seen a real early case, that is in the first few hours. Doctor Lipshutz' figures are concerned largely with mortality, but the speaker felt that due consideration should also be given the question of morbidity. In other words, it is not so much a question as to whether one can operate upon acute cholecystitis immediately and not kill the patient, but whether patients so operated upon progress as uneventfully to recovery as those in whom the more conservative plan is followed.

Dr. Adolph A. Walkling said he thought we must consider the fact that more perforations occur in older people. He believed that the longer an infection is present in the biliary tract, regardless of its position, the more damage is done to the liver cells and consequently the greater the operative risk. This fact is important. If the acute symptoms do not subside readily, then cholecystectomy should be done.

Dr. Ralph Goldsmith agreed with Doctor Brown. In patients who are not too bad risks, and who are admitted early, say in the first 24 to 48 hours, it is relatively easy and extremely desirable to rapidly increase the fluid and glycogen reserve. He felt that if these people tend to get worse it is advisable to operate without further delay. The speaker had two unhappy experiences with perforated gallbladders due to excessive conservatism. In most cases, however, the acute symptoms tend to subside under appropriate treatment. As regards the choice of operative procedure, he does not hesitate to do a cholecystostomy where the difficulty of a cholecystectomy would add materially to the risk.

Dr. John P. North said that it was not very clear as to just what was meant by immediate treatment. Does Doctor Lipshutz mean that the case should be treated the same as, for example, an acutely inflamed appendix or does he mean that a patient with acute cholecystitis should be operated upon after a relatively short period of intensive preparation with glucose, fluids, *etc.*? The speaker's experience with cases operated on in the acute stage has been limited but in cases so operated he has always been surprised at the smoothness of the recovery. In spite of this it would seem that delayed operation is preferable to an immediate procedure unless the patient fails to improve or becomes worse after a few hours of observation.

Dr. Benjamin Lipshutz said in closing that the premise here set forth is that prompt surgery is the advisable method of procedure in the treatment of acute cholecystitis. No ironclad rule can be advanced here or elsewhere in surgery; careful surgical judgment must be exercised and followed.

Essentially, if the diagnosis is reasonably clear, and the patient is in good condition, early surgery should carry but little risk. Most cases of acute cholecystitis, particularly the type caused by a calculus obstructing the cystic duct, yield positive bacterial cultures. And the early removal of this infective focus would appear to be the safer procedure.

Every patient is gone over by an internist, the routine laboratory studies done, and fluids administered parenterally if dehydration is present. The interval between admission of the patient to the hospital and time of operation ranged between a few hours to three days. The majority of the cases were subjected to surgery within 24 hours after admission. The anesthesia is either nitrous oxide-ether sequence, or spinal. The latter is advisable, if the patient is obese, in order to secure satisfactory relaxation. An intravenous drip is begun simultaneously with the spinal anesthesia, and is continued throughout the operation, being maintained if indicated, when the patient is transferred from the operating room to bed. The use of the intravenous drip with the spinal anesthesia has, at least in his experience, proved to be the best aide in guarding against fall of blood pressure in the presence of spinal anesthesia.

CHOLECYSTODUODENAL FISTULA

Dr. Harry E. Knox reported the case of a boy, eight years of age, who was admitted to the Episcopal Hospital in the service of Doctor Mutchler, September 20, 1932. His chief complaint was that of pain in the right side of the abdomen, which began the day before in the right axilla, followed by vomiting. At 5 A.M. on the day of admission, he was awakened by pain in the abdomen, again followed by vomiting. The vomitus did not contain blood nor bile, but food he had eaten the night before.

His family history was negative. His personal history revealed he had had scarlet fever, measles and whooping cough. Otherwise his general health had always been good.

The physical examination showed an internal squint of both eyes; tonsils hypertrophied. His heart and lungs were negative. The abdomen was slightly distended. There was acute tenderness over McBurney's point and marked rigidity of the lower right rectus muscle. Peristalsis were present, although somewhat less marked in the lower right quadrant. His temperature was 100°, pulse 86 and respirations 22. He had a leukocytosis of 16,900 with 90 per cent polymorphonuclears, erythrocytes 3,900,000. A urine examination was negative.

A diagnosis of acute appendicitis led to an immediate operation, which was performed under ether anesthesia through a lower right rectus incision. Upon opening the peritoneal cavity a small amount of free bile-stained fluid was noted. The cecum was delivered, and an appendix only slightly diseased was removed without difficulty. Owing to the bile stained fluid encountered, the gallbladder region was explored by palpation and adhesions

noted. With the idea of making a second incision, the lower incision was closed. As the operation was an emergency and the time was near midnight, the supervising nurse, seeing the wound being closed, decided of her own volition that all was over and promptly dropped all instruments into the sink preparatory to cleaning up; so that, rather than risk prolonged anesthesia, the patient was returned to the ward. His immediate postoperative course was uneventful. He continued, however, to complain of abdominal pain, but at this time he began to localize it definitely in the epigastrium. His appetite was poor, but no vomiting occurred. On October 10, three weeks after his appendectomy, an *x*-ray study of his gastro-intestinal tract was made. The late Dr. Gary Miller reported "all findings point to an ulcer in the first portion of the duodenum, but the diagnosis is made with reservations because of the age of the patient."

With the continuance of pain and positive *x*-ray findings together with our knowledge gained from his previous operation, a second laparotomy was performed through an upper right rectus incision. Upon opening the peritoneal cavity, there was found a considerable amount of dark bilecolored fluid. The intestines were covered with a plastic exudate. Adhesions were separated, and the field thoroughly visualized. There was a distinct joining of the gallbladder to the duodenum. No stones palpable in the gallbladder, the induration of the duodenum prohibited proof of a duodenal ulcer. The gallbladder was separated from the duodenum, the opening in each closed, followed by gastrojejunostomy performed without difficulty.

His immediate postoperative course was stormy, but he reacted well, making a complete recovery, and was discharged three weeks later. To date he has remained well and symptom-free.

The significant points of this case of cholecystoduodenal fistula are that it occurred in a child of eight years without any previous symptoms of duodenal or cholecystic disease, such as epigastric pain, hematemesis, or melena, indigestion, chills or fever, and no history of jaundice, and that treatment of the lesion must be surgical, whether it be primarily in the gallbladder or in the duodenum.

Spontaneous fistulous communications between the biliary tract and gastro-intestinal tract sometimes occur as a complication in disease of the gallbladder or the bile ducts. It is a serious complication of cholecystic disease, increasing the potentiality for further infection of the biliary system already definitely diseased, and increases the morbidity and mortality of operations upon this system. The close proximity or anatomic relationship between the gallbladder and the duodenum favors production of such a fistula in the presence of progressive cholecystic or duodenal disease, and hence is the most common type of internal biliary fistula.

These fistulae may communicate directly with the viscus into which the fistula opens, or indirectly communicate through the bed or route of some

abscess cavity. It has only been within recent years that internal biliary fistula have been removed from the sphere of pathologic interest. The range of these fistulae is almost unbelievable. Cases have been reported as occurring between the gallbladder and its ducts, the stomach, all parts of the intestinal tract, liver, pancreas, portal vein, urinary and the female genital tracts. Fistulae between the gallbladder and abdominal wall are not uncommon. In one series of 1,117 cases operated upon at The Mayo Clinic, Judd in 1932 reported biliary fistulae occurring in only 0.8 per cent. Because of the close association of the gallbladder and duodenum, it is often impossible to say whether a duodenal ulcer has involved the gallbladder or whether an acute gallbladder has ulcerated into the duodenum.

BRIEF COMMUNICATIONS

PRIMARY CARCINOMA OF THE DUODENUM

THIS case is reported because of the rarity of this type of carcinoma, the age of the patient and the difficult diagnostic problem involved.

The patient was a white married woman, aged twenty-four years, who was admitted to the Harbin Hospital February 9, 1932, on account of epigastric distress with nausea and vomiting, progressive jaundice, weakness and loss of weight. For one year she had had "stomach trouble," that is, epigastric distress after meals with nausea and vomiting. These symptoms were present intermittently until about two weeks before admission and then the vomiting became very persistent, the amount of material vomited being large. She had rather severe cramping epigastric pain associated with and usually relieved after vomiting.

About one month before admission the patient began to be jaundiced. This symptom continued until the time that she was first seen, gradually becoming more pronounced. During that month she lost about twenty pounds in weight, her weight at the time of examination being 100 pounds.

She was an emaciated, deeply jaundiced woman, with moderate tenderness in the epigastrium. The liver extended three or four centimeters below the costal margin. In the epigastrium just to the right of the midline a small, hard, slightly movable mass was felt. Peristaltic waves were seen in the region of the umbilicus at the time the patient complained of cramping pain. Her temperature was 99 2/5°; pulse, 100; red blood-cells, 3,860,000; hæmoglobin, 70 per cent; and leucocyte count within normal limits. The stools did not contain any bile but the reaction for occult blood was strong. The urine was negative with the exception of two plus bile and the Kahn test was negative.

A roentgenogram of the gallbladder, without dye, did not show any pathology. A fluoroscopical examination of the stomach with a barium meal revealed that the stomach was moderately dilated but otherwise negative. A constant filling defect was seen in the distal part of the first portion of the duodenum. The duodenum proximal to this obstruction was dilated with rather pronounced peristaltic waves. A small amount of barium was seen to pass by the obstruction. The epigastric mass was located at the point of obstruction. There was marked gastric retention. Two-thirds of the barium meal remained in the stomach at the end of six hours and about one-third at the end of twenty-four hours.

A definite diagnosis could not be made as to the cause of the biliary and duodenal obstruction but the probability was thought to be carcinoma of the head of the pancreas.

An exploratory laparotomy was done. The gallbladder and common bile duct were found to be greatly distended. At about the junction of the first two portions of the duodenum, a hard, slightly irregular mass was felt which seemed to be in the lumen of and firmly attached to the walls of the duodenum. The head of the pancreas was slightly enlarged. The mass did not have any firm connection with the pancreas. The stomach and duodenum proximal to the mass were dilated. The gallbladder was anastomosed to the duodenum about three centimeters proximal to the mass. A gastro-enterostomy was discussed in view of the duodenal obstruction but decided against because of the weakened condition of the patient. The patient's convalescence was very satisfactory and the

jaundice gradually disappeared. About the eighth or ninth postoperative day she had some vomiting and complained of a full feeling in the epigastrium after eating. The wound healed promptly and she was allowed to go home eleven days after the operation.

After being at home for a few days she began to vomit large amounts of greenish material several times a day and was readmitted to the hospital for observation. When no fluids were given during the night, a morning gastric retention of 400 to 500 cubic centimeters was present. The red blood count at that time was 2,100,000. Her general condition improved slightly and she was allowed to go home after four days and was told that a second operation would be necessary as soon as her condition permitted.

During the following five weeks she had some vomiting from time to time but retained considerable food and fluid. Her strength increased but she was unable to regain any weight. The red blood count at that time was 3,670,000. A gastro-enterostomy was advised but refused by the patient. During the next two weeks she began to lose strength and weight, her weight at that time being seventy pounds, the vomiting increased and the amount of food and fluid retained was very small, if any. The only chance of prolonging her life for a short period of time still seemed to lie in a gastro-enterostomy to which the patient finally consented. At operation the anastomosis between the gallbladder and duodenum was found firmly fixed by adhesions, the mass in the duodenum was slightly larger than at the time of the first operation, with practically no fixation to the pancreas. The latter organ was practically normal in size. There were no metastases in the adjacent lymph nodes or the liver. A posterior gastro-enterostomy was done. The patient stood the operation remarkably well considering her general condition. On the fourth postoperative day she was taking soft food in small amounts without any discomfort and had had no vomiting. On the same day her temperature, which had been normal, increased to 102° and physical signs of an infection in the lower lobe of the right lung were present. During the next few days her temperature, pulse and respiration gradually increased and she died on the ninth postoperative day from the infection in her lung. There was no vomiting and she took liquids and soft food until shortly before her death.

FIG. 1.—Carcinoma of the duodenum.

A partial necropsy was obtained, the examination being limited to the mass in the duodenum. The abdominal organs were essentially the same as at the time of the last operation and the gastro-enterostomy was intact. The growth was an annular, stenosing, papillomatous tumor attached to the wall of the first part of the second portion of the duodenum, the lumen being almost completely occluded. The pancreatic and common bile-ducts entered the mass in its distal part and were occluded. The report of the pathologist, Dr. E. L. Bishop, was "the duodenum shows an adeno-carcinoma, Grade II, radioresistant. The structure is composed of neoplastic glands of irregular shape, lined by hyperchro-

matic cylindrical cells. In one portion there is a diffuse infiltration without glandular formation."

Carcinomas of the duodenum constitute 0.2 to 0.4 per cent. of all carcinomas and 2 to 4 per cent. of intestinal carcinomas. They are found more frequently in the male than in the female, the ratio being 3 to 1 and the average age is between fifty and sixty years. In the literature reviewed, reports of two cases younger than this patient were found, the youngest being a patient sixteen years of age, reported by Ewald.

Probably the best classification of these neoplasms is according to their location in the first, second or third portions of the duodenum. True primary

FIG. 2.—Proximal view.

carcinomas of the duodenum occur with about the same frequency in the first and second portions and less often in the third portion, when carcinomas of the papilla and ampulla of Vater are not included in the classification. These growths are usually cylindrical cell adeno-carcinomas derived from the mucosa of the duodenum and the majority have a tendency to encircle the duodenum, producing stenosis. Some have the form of deep ulcers with fungated bases. This tumor is thought to be a primary growth of the second portion, producing an almost complete occlusion of the lumen of the duodenum and secondarily involving the papilla of Vater. When tumors are found in the periampullary region, it is often difficult to say whether the origin was from the papilla of Vater or the duodenal mucosa,

but carcinomas of the papilla as a rule are circumscribed about the papilla and seldom obstruct the intestine, whereas primary duodenal carcinomas often produce obstruction. Histologic examination may be of no value in the differentiation.

Carcinoma of the duodenum is often overlooked because of the general prevailing opinion that such lesions do not exist. This is due to the relative infrequency of this lesion and because of its close resemblance clinically to carcinoma of the head of the pancreas. This case was found to be a typical one clinically when compared with the other carcinomas of the duodenum reported in the literature. The syndrome of persistent and increasing epi-

FIG. 3.—Longitudinal section.

gastric distress with nausea and vomiting, weakness, loss of weight, a palpable epigastric mass, visible peristaltic waves, jaundice, acholic stools with occult blood and a filling defect in the duodenum by *x*-ray, should suggest carcinoma of the duodenum.

In view of the fact that carcinomas of the duodenum usually produce symptoms early and metastasize slowly, the prognosis should theoretically be good. Clinically, however, the average duration of life after the onset of symptoms is about one year. The treatment is surgical.

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A MODIFIED RAMMSTEDT OPERATION

FOR CONGENITAL STENOSIS OF THE PYLORUS

THE Rammstedt operation is the most widely accepted and useful procedure for congenital pyloric stenosis. Briefly, the most important step in this operation is a longitudinal incision of the thickened serosa and muscularis down to the mucosa, but not through the latter.

FIG. 1.—To show the relations of the duodenum, pyloric vein of Mayo and pyloric tumor.

No matter how cautiously one may proceed, it is hard to avoid inadvertently opening the mucous membrane during the operation. This mishap allows an escape of duodenal or gastric contents, according to its location.

The usual location of the perforation is near the distal end of the longitudinal incision over that part of the tumefaction that slopes abruptly to meet

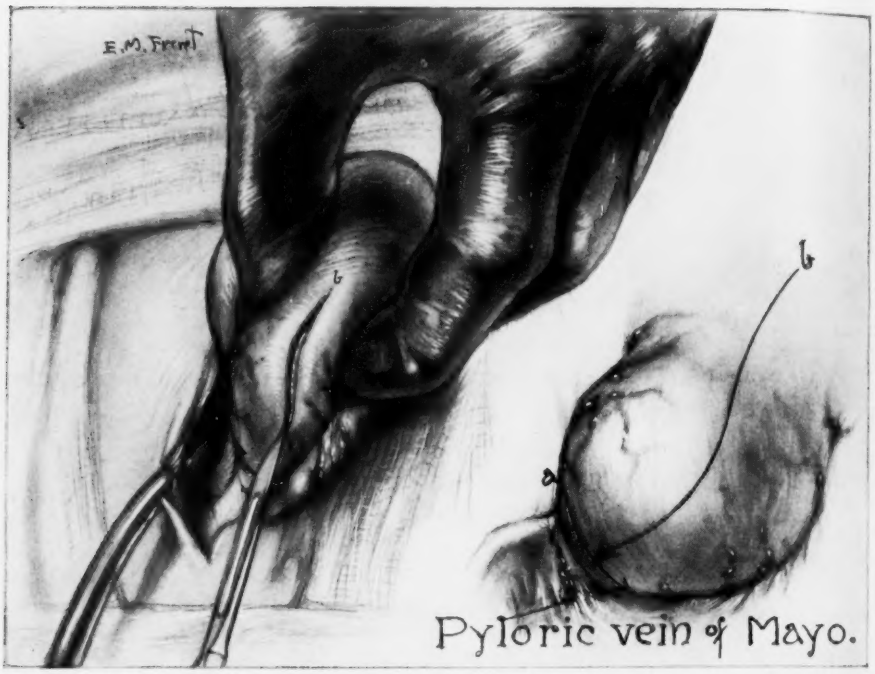

FIG. 2.—(a) Marks the vertical incision proximal and parallel to the pyloric vein. (b) The long transverse incision bisects the anterior wall of the pyloric tumor.

FIG. 3.—The spread of the longitudinal incision beginning at the proximal end. A blunt pair of scissors is used.

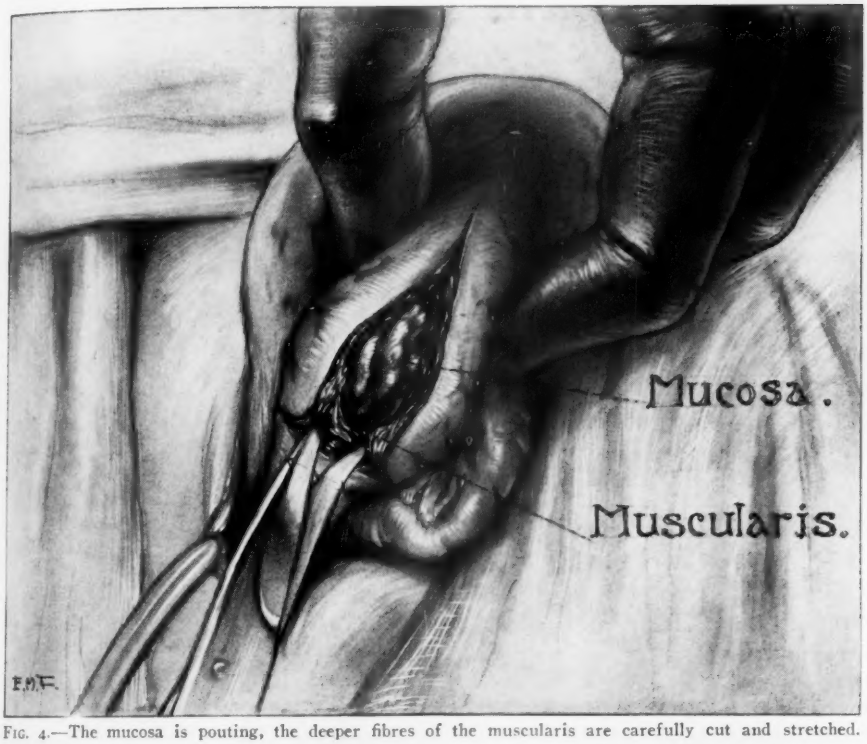

FIG. 4.—The mucosa is pouting, the deeper fibres of the muscularis are carefully cut and stretched.

FIG. 5.—The end-result is an open area, roughly triangular in outline. The widest part is close to the sphincteric muscle. The mucosa bulges out.

the flattened and narrow duodenum. Manipulation here in an attempt to spread the cut edges of the hypertrophied pyloric muscle wide apart causes the tightly infolded longitudinal folds of mucous membrane to pout, subjecting it to the danger of tearing or perforation.

Especially is this likely to occur when the infant has been given barium or bismuth mixture for röntgenographical study, and where these substances have become tightly wedged into and fill the narrow channel. The normal grayish or bluish shimmer of the mucosa is then less easily defined, and the dissection becomes correspondingly more difficult.

Such a mishap to the mucous membrane must be instantly corrected by accurate and painstaking coaptation. This complication is often followed by a localized exudate over the operative area, which in itself may superimpose further obstructive lesions upon the original condition. Peritonitis, even of low grade and in limited area, developing in so young and poorly nourished a subject may often prove most serious, if not fatal.

Recently I have been employing a modification of the classical Rammstedt operation which simplifies the entire procedure and makes it both safer and more adequate. It allows a wider separation of the cut margins of the hypertrophic muscles, with a generous protrusion of mucous membrane. This is all accomplished close to the sphincteric muscle and at the narrowest part of the pyloric tumor, where the construction of a wide and ample lumen is the purpose of the operation.

Operation.—(Part I.) The pyloric vein of Mayo is carefully identified at the area between the flat duodenum and the nearest end of the rounded tumor (Fig. 1). A vertical incision is made 0.5 centimeter proximal and parallel to this vein (Fig. 2-a). It should traverse almost the entire width of the wall, usually on the abruptly distal sloping surface of the tumor mass. Rarely is any active bleeding encountered. No attempt should be made at this time to carry the incision to the deeper layer of muscle or to the mucous membrane.

Operation.—(Part II.) (Fig. 2-b.) A second longitudinal incision is started on the wall of the stomach beyond the tumor mass. It practically bisects the anterior half of the pyloric tumor and is directed downward to meet the midpoint of the vertical primary incision. The length of this incision is important. My experience is that it is best made sufficiently long, 4–5 centimeters. The edges of the longitudinal incision are now separated slowly but widely with a pair of blunt Mayo scissors, working from above downward toward the vertical incision (Fig. 3). Gradually the deeper muscle fibres separate, leaving the mucous membrane to bulge out through the lips of the transverse incision. Continuing this dissection, the muscular layers at the junction of the vertical and horizontal incisions will readily give way, leaving a wide gap which is roughly triangular in outline (Fig. 4) with the base toward the duodenum. Through this space a large quantity of mucosa will protrude to complete the major purpose of the operation. This procedure provides a wide exit for the stomach close to the sphincteric muscle and best corrects the hypertrophic pyloric stenosis (Fig. 5).

This operation has been performed with satisfactory results in the last six patients.

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HOUR-GLASS STOMACH ASSOCIATED WITH ŒSOPHAGEAL STENOSIS

EXCEPT for an occasional reference nothing is said in the literature about the possibility of the occurrence of hour-glass deformity of the stomach and œsophageal stenosis in the same patient, hence the special interest attaching to the case now reported.

The patient is a man, forty-four years of age, whom I first examined May 13, 1931. He gave a history of having felt well, except for "heart-burn" which had been present daily since he was twenty-five years of age, until several days previous to my examination when he had been suddenly taken ill following the drinking of a cup of coffee. The swallowing of the coffee was followed immediately by the occurrence of severe burning pain high in the epigastrium. The "heart-burn" described occurred about eleven o'clock in the morning and about four o'clock in the afternoon. It was so severe as to necessitate his leaving work to obtain a glass of milk, which always relieved him. He had never tried to obtain relief in any other way. He had called a physician immediately on the onset of the epigastric pain, who sent him to the hospital. During the first few days of his hospitalization the only food that he could take was milk as anything other than this caused a burning sensation immediately below the sternum, and hiccough. He lost weight rapidly. Improvement occurred in his general condition and in his ability to take nourishment until he could swallow a soft bland diet. When first seen by the reporter he was well developed and well nourished. There was a marked pharyngitis with inflamed tonsils. The temperature varied between 101° and 102° during the six days that he remained in the hospital. The urine showed a faint trace of albumin. The leucocyte count was 19,000. No evidence or history of syphilis. A definite diagnosis was not made other than the obvious one of a subacute tonsillitis with pharyngitis.

He was re-admitted to the hospital June 8. Previous to this he had been *x*-rayed and a diagnosis of hour-glass stomach made. The patient's symptoms were hiccough and burning pain immediately below the sternum on the taking of any food, liquid or solid, except milk and raw eggs. Food would not, with the exception of the above, pass into his stomach without his regurgitating part of it, at times as late as thirty minutes after swallowing, the interval filled with the most violent pain, retching and hiccough. His condition following discharge from the hospital in May until this admission had been one of constant illness. The slight improvement present before his discharge had been quickly lost and with the increase in the severity of his symptoms he had continued to lose weight. No obstruction of the œsophagus was reported on the first *x*-ray examination. He was again *x*-rayed and no report was made of œsophageal obstruction. The obstruction in the stomach was so nearly complete that early operation was necessary, which was done June 12.

The section revealed a fibrous constriction about the middle one-third of the stomach in its proximal part (Fig. 1). The stomach was not adherent to any of the surrounding structures and there was no obstruction of the pylorus. The constriction covered several centimeters in the transverse diameter of the stomach. Both the greater and lesser curvatures were drawn toward the middle, the greater much more than the lesser curvature. The stomach lay high up in the abdomen and as the constriction was in the proximal part of its middle third, it would have been difficult to have done any type of plastic operation or resection. An anterior gastro-enterostomy was done with an entero-anastomosis.

The patient following operation did not improve and he remained unable to take anything by mouth other than milk, cream, nearly raw eggs and water. A small mouthful of watermelon caused such severe pain, hiccough and retching that morphine was necessary to relieve him. He never vomited anything but a small bit of the food taken and a little mucus. So much discomfort was experienced during attempts to pass a

stomach tube that it was abandoned. June 22 an œsophageal speculum was passed and a spastic condition of the crico-pharyngeus muscle was noted. At that time the patient was complaining also of spasm of his throat which interfered with swallowing. July 2 an *x*-ray examination revealed a contraction at the cardiac end of the œsophagus. Two days later he was again œsophagoscoped and the lower end of the œsophagus examined. At the cardiac end a very tight stricture was encountered, the edges of which showed a granulating surface which bled very easily. The smallest dilator would not pass. Several days later, after having succeeded in getting a string through the stricture, a small dilator was threaded on the string and an attempt was made to pass it into the stomach. This was not successful. A small piece of tissue taken from the granulating area showed

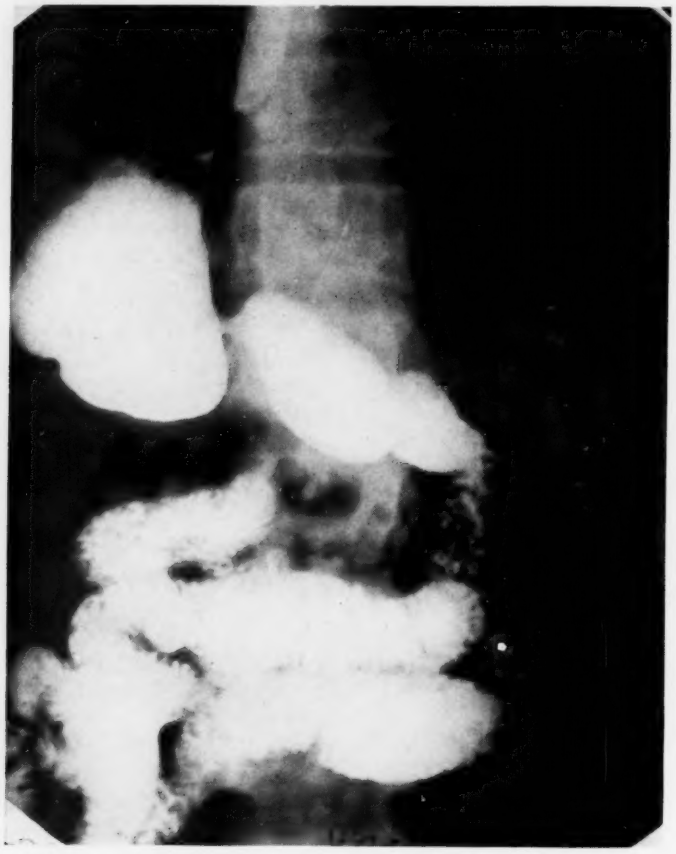

FIG. 1.—Röntgenogram before operation showing hour-glass stomach.

the ordinary granulation tissue. At this time he was sent to Dr. Chevalier Jackson in Philadelphia for consultation and treatment, who dilated the stricture from below after a preliminary gastrostomy. This having been successfully done the patient returned to Washington for further dilation and closure of the gastrostomy. This has been successfully carried out. Due to the difficulty of closing the gastrostomy experienced because of the close proximity of the gastro-enterostomy and the gastrostomy, both being located on the anterior wall of the stomach in its upper one-third, the patient has developed a hernia which may require repair. It has also been necessary to continue dilation of his œsophagus about once a month. He has gained weight and strength slowly but steadily. His weight and height, not previously mentioned, are 138 pounds and five feet nine

inches. It is interesting to note that the healing of the ulcerated area in the œsophagus was not obtained until an application of 10 per cent. silver nitrate was made. Under this treatment healing rapidly occurred. One remission occurred about a year later when there was a recurrence of ulceration involving a small area above the original site. Application of nitrate of silver to this area gave him relief.

The etiology of hour-glass stomach is well summarized by Eusterman,[1] who states that the majority of hour-glass stomachs are the result of intrinsic ulcerative processes. In a few instances the deformity, according to Eusterman, results from postoperative adhesions following excision of a gastric ulcer, compression by an extrinsic tumor, congenital bands or fistulas, the ingestion of corrosives, spasms of the gastric musculature or tight lacing. Eusterman doubts the occurrence of congenital hour-glass stomach and feels that the presence of an hour-glass deformity at birth is not due to unusual embryonic development but is due to the presence in the stomach *in utero* of an ulcerative process with contraction. The possibility of a congenital hour-glass stomach is admitted by Moynihan[2] who states that there has been but one undoubted case reported.

The history of a gastric complaint with ulcer characteristics which had persisted for years, we feel, is a definite indication that the hour-glass deformity developed as a result of a peptic ulcer of the stomach.

The pathology found in the œsophagus, coupled with the clinical history, is more difficult to explain. Ingestion of a corrosive should have given burns in other parts of the œsophagus and mouth. Any knowledge of such an ingestion has been steadily denied. The biopsy and the patient's improvement preclude the possibility of malignancy. The presence of the encircling constriction with marked fibrosis in the stomach suggests a pathological similarity to the constriction about the œsophagus.

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MOBILIZATION OF THE DESCENDING COLON AS AN OPERATIVE MANŒUVRE

If a lesion in the pelvic colon or rectum requires resection, it is often necessary to establish permanent colostomy. In some such cases, however, permanent colostomy may be avoided by mobilization of the descending colon, making an anastomosis possible between the proximal and distal segments of bowel. This manœuvre is not a new operative procedure. Attention is directed to it because not infrequently a case is observed in which a segment

of the pelvic colon has been resected and permanent colostomy established from the descending colon. The two cases which I am reporting here are examples of this procedure.

The patients were married women, aged twenty-six and thirty-one years, respectively. Five and eight months previously each had undergone an operation elsewhere because of pelvic tumor. In both instances the tumors were described as infected left ovarian cysts causing obstruction, by encroachment on the pelvic colon. In both operations a segment of the pelvic colon was removed, the lower end of the sigmoid or upper part of the rectum was inverted, and the distal portion of the descending colon was brought out of the abdomen as a permanent colostomy. The patients presented themselves for examination in the hope that the continuity of the bowel might be reëstablished.

Both patients were in excellent physical condition. The rectum in each case was

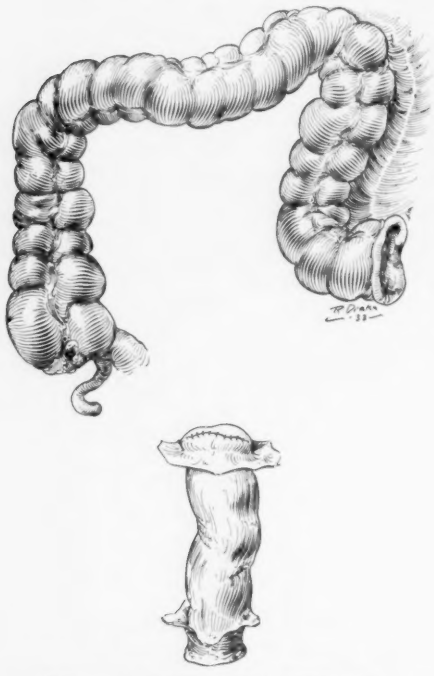

FIG. 1.—Colostomy; rectal stump closed.

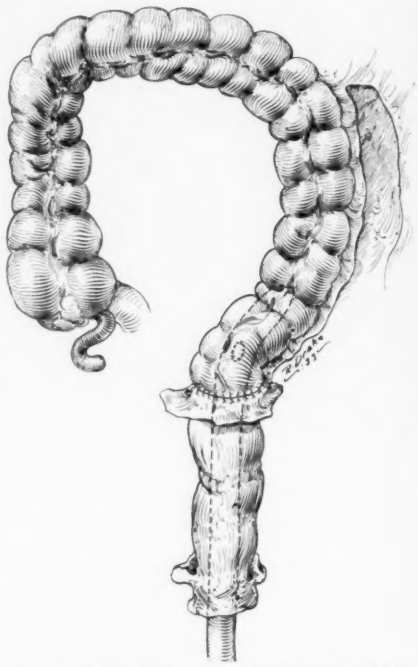

FIG. 2.—Anastomosis of terminal portion of the colon and rectum.

normal on digital and proctoscopical examinations; the proctoscope could be inserted to a distance of eighteen centimeters. A roentgenogram of the remainder of the colon following a barium enema introduced into the colonic stoma was negative. Exploration in both cases was carried out through a low median line incision. The proximal stump of the pelvic colon was identified at a point about seven centimetres above the pelvic peritoneal fold. The attachment of the descending colon to the abdominal wall forming the colonic stoma was cut off. The outer leaf of peritoneum of the descending colon was divided from the level of the colonic stoma to the splenic flexure (Fig. 1). This allowed sufficient mobilization to make an end-to-end anastomosis with the stump of pelvic colon (Fig. 2). The procedure was carried out over a tube introduced into the rectum, a modification of the Balfour method. As a precaution a Witzel type of temporary enterostomy was made in the terminal portion of the ileum by means of a No. 15 French catheter. Both patients recovered satisfactorily. Convalescence was somewhat

prolonged because of some infection in the wounds, which, because of the nature of the procedure and the existing colonic stoma, might be regarded as unavoidable. In one case a fæcal fistula developed in the lower angle of the abdominal incision, apparently due to slight leakage from the suture line, which persisted for three months. Both patients seem now to have fully recovered and activity of the bowel is normal.

At least part of the function of the outer leaf of peritoneum on both the ascending and descending colon is to anchor or hold the bowel in position. In carrying out the procedure described traction must not be placed on the inner leaf of the mesentery in order to avoid circulatory embarrassment. The surgeons who performed the original operation on these two patients were wise in not attempting to anastomose the two segments of bowel at the time of the resection. In resections of the pelvic colon, ligation of the superior hæmorrhoidal vessels is necessary; therefore, the distal segment of bowel, if it remains viable, must receive its blood supply by means of the middle and inferior hæmorrhoidal vessels. It has been thought in some instances that if the superior hæmorrhoidal artery is ligated, the rectal stump dies. In these two cases the circulation by means of the middle and inferior hæmorrhoidal vessels furnished sufficient blood supply to the rectum and the remainder of the pelvic colon. If an anastomosis is contemplated between the descending colon and the lower part of the sigmoid, it is wise to allow sufficient time to elapse in order that the viability of the distal segment can be determined. The manœuvre described is advisable, I believe, for patients who are in good condition, not of advanced age, and who do not show evidence of malignant change.

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From the Division of Surgery, Mayo Clinic.

BOOK REVIEWS

OPERATIVE GYNECOLOGY. By H. v. PEHAM, M.D., Professor of Obstetrics, University of Vienna and J. AMREICH, M.D., Privatdozent for Obstetrics and Gynecology, University of Vienna. Translation by L. KRAEER FERGUSON, M.D., Associate in Surgery, University of Pennsylvania. 2 vols.; 800 pp.; 448 illustrations, many in colors; cloth; atlas size. J. B. Lippincott Company, Philadelphia, 1934.

The present reviewer had the good fortune to receive the original German loose-leaf copies of this work, as they came off the press, and felt a very special interest in seeing how the translation would compare with the original. It is a pleasure to state that it is excellent and fascinating reading. Doctor Ferguson is to be congratulated on his ability in rendering the exact shades of meaning from the German into English.

The characteristic feature of the book is the original and individual course that it takes. The results reported have been worked out, tested and statistically established by the authors. All subjects are dealt with in a concise and easily understood manner. There is much original material; the book is not filled with hypotheses.

Of the three parts into which the work is divided, the first describes all methods, materials and details essential to the adequate preparation for all gynecologic operations and their successful performance. The second part, finely illustrated, deals with the surgical anatomy of the female pelvis. The third section, the operative, presents the procedure of different operations; the reader who follows text, illustrations and legends, obtains a wonderfully clear and complete picture of an operation from its first step to its last. The book has the incalculable advantage of the individual touch.

Particularly instructive is the section describing the position of the patient on the table and the reason for using the Trendelenburg position. As many surgeons still wall off the intestines in every pelvic operation, keeping the patient prone on the table, to them, especially, this section should prove interesting, particularly in regard to the immediate convalescence of the patient. Another striking point is the stress laid on the disadvantages of rough assisting, by internes or nurses, too much sponging, and rough retraction, all of which, in the reviewer's mind, are more frequently the cause of so-called skin infection than poor preparation of the skin or neglected asepsis of the operating personnel.

The chapter on Anesthesia, complete in every detail of anatomic and technical description, presents some new material, particularly in relation to hypogastric, ovarian and pudic nerve block anesthesia for the Schuchard incision. This block anesthesia administered through the vagina is a novel and unique method in pelvic anesthesia. The text and illustrations on the anatomy of the nervous system deserve special commendation.

In the excellent section on postoperative complications and their prevention, the discussion, particularly, of postoperative pulmonary atelectasis is complete and instructive and should help in clearing up the controversy into which the subject has fallen in this country. Atelectasis, as the authors describe it, is scientifically sound. In their method of diagnosis, clinical signs take precedence over the roentgen rays, in contrast to the American tendency to rely principally on *x*-ray diagnosis. Another excellently treated subject is that of postoperative paralytic ileus, especially of the large intestine.

In the second volume, in the section on hysterectomy, the writers assert their opinion that abdominal and vaginal hysterectomy are the most important operations in gynecology and use these as the standard for the qualifications necessary for any operation in gynecology. A properly done hysterectomy presents all the anatomic structures in the pelvis; therefore, if you qualify for this, any other operation in gynecology should be easy. The writers, preferably, do a vaginal hysterectomy for every operable case of cancer of the cervix. Their work should stimulate the teaching of the technic of vaginal hysterectomy to a greater extent than heretofore, to students and internes. The operation should have a place in his selective technic. Vaginal hysterectomy in the presence of myoma uteri is important both because of the ease with which it is performed by the properly instructed gynecologist and because of the excellent clinical results following its use.

In the description of cancer of the cervix, the indications for operation, as given by the authors, their selective classification of the various types of cervical cancer and their methods of diagnosis, form one of the best accounts found in any gynecology.

Cancer of the vulva is also treated and illustrated at greater length than usual. There is an excellent description of the Schuchard incision to enlarge the vagina so as to give the operator more room, a technic frequently useful. In all of their descriptions of cancer operations, the writers have stressed, by the use of illustrations, the importance of removing the connective tissue *en masse*, along with the glandular structure, in order to eradicate all cancer rests therein.

There is an excellent account of prolapse uteri and of sphincter insufficiency. The reviewer was interested in the report of the operation for incontinence by the method of overlapping endopelvic fascial flaps. He has used this technic without a failure and is enthusiastic over its merits.

This work should be in the library of every surgeon and gynecologist. It contains unique material. To read the two volumes is like taking a clinical course abroad under new masters in gynecology. The work will become a classic such as Kelly's Gynecology of thirty-five years ago or Cullen's work on Cancer of the Uterus. The anatomy of the pelvis and the steps of all operations are demonstrated with such thoroughness that the reader seems to participate in the entire action.

It is to be hoped that this book will stimulate our American publishers to be more generous in allowing more color illustrations, and American writers to make more drawings from dissections and preparations. In a

text-book for surgery, and especially gynecology, illustrations are the most important part of the work. ARTHUR J. WALSCHEID, M.D.

GYNECOLOGY. By BROOKE M. ANSPACH, M.D., Professor of Gynecology, Jefferson Medical College, with the assistance of PHILIP F. WILLIAMS, M.D., and LEWIS C. SCHEFFEY, M.D., 812 pp.; 679 illustrations, 10 in colors. J. B. Lippincott Company, Philadelphia, 1934.

The scope of this book is to present, in text-book style, what the author has found most practical for the student, general practitioner, and specialist in gynecology. Much progress has been made concerning the physiology of the reproductive organs; hence, our conception as to the nature and the origin of certain diseases has been altered and our methods in the practice of gynecology have been improved.

This text presents the combination of the select literature on the subject with proper observations gathered from clinical experience.

For the student of medicine, the basic factors of embryology, anatomy and physiology are emphasized because of their influence on gynecologic diagnosis. Variations from these mark abnormal morphology, morbid physical changes that lead to the many functional disturbances observed in gynecologic practice. Following the chapters on the fundamental subjects of anatomy, physiology and embryology, chapters on history taking, physical and laboratory examinations are considered before entering into the field of gynecologic practice.

For the general practitioner numerous suggestions are given for office and bedside treatment of gynecologic patients. Medical gynecology is very fully considered. The text is not entirely dwarfed by too numerous surgical procedures and illustrations. For the specialist most recent advances are considered in a very intelligent and concise manner.

This book may be recommended to students, practitioners and specialists as a well-balanced text-book of gynecology.

VINCENT P. MAZZOLA, M.D.

APPLIED ANATOMY. By GWILYM G. DAVIS, M.D., Late Professor of Orthopaedic Surgery, University of Pennsylvania. Revised and rewritten by GEORGE P. MULLER, M.D., Professor of Clinical Surgery, University of Pennsylvania. Ninth edition. J. B. Lippincott Company, Philadelphia, 1934.

For twenty-four years this classic has been the text-book of the American surgical profession and the publication of the ninth edition, revised, reset and rewritten, will be welcomed as a tried and trusted friend. The edition brings us a wealth of applied anatomic knowledge; the concise presentation, the balance of the subjects and the soundness of the principles underlying the surgical teachings, make this a true helpmate to the student, the practitioner, and the surgeon.

The surgical advice regarding operations, fractures, dislocations, amputations, resections, *etc.*, mirrors the soundest surgical principles of the day and evidences a profound knowledge which has been ripened by the practical

hand of clinical experience. The advance in the surgical specialties has been justly recognized and many of the sections have been revised and rewritten, notably those on the brain and spinal cord, gynecology and urology. An extensive revision has also been carried out in the section on the abdomen.

The artist has taken advantage of the resettings to add many excellent illustrations and to retouch some of the previous plates. The task of the editor in balancing the different sections and evaluating the surgical procedures has been carried out with rare judgment, resulting in a work which will be invaluable to the student, practitioner, and the surgeon.

H. H. M. Lyle, M.D.

Benign Encapsulated Tumors of the Lateral Ventricle. By Walter E. Dandy, M.D. 189 pp.; 120 illustrations; Williams & Wilkins Company, Baltimore, Md., 1934.

As in his recent monograph on Tumors of the Third Ventricle, Dandy places the greatest diagnostic reliance upon ventriculography which is naturally most informative. For this reason, it has been only since the almost routine use of air injected into the ventricles, or at least into the subarachnoid spaces at lumbar puncture in the process of encephalography, that many intracranial tumors, and especially those in the ventricles, have been more than just suspected, and to the author must be accorded full credit for this tremendous advance in the diagnostic armamentarium. Various workers in this field, however, differ regarding the advisability of using ventriculography. In this clinic, air never is injected directly through a puncture of the cerebral cortex into either lateral ventricle for diagnostic and localization purposes unless attempts to obtain satisfactory encephalograms by the lumbar puncture method have not been successful, and at no risk of cerebral damage to the patient. The percentage of cases where the latter method fails to demonstrate air in the ventricle is very small indeed. When the air does not enter the upper ventricular system with encephalography, then intraventricular or at least neighborhood expanding lesions must always be suspected; it is in only these latter cases (subtentorial lesions having been excluded) that ventriculography is used in this clinic.

Dandy details a series of fifteen cases of tumors of the lateral ventricles, disclosed either at necropsy or at operation; this forms probably the largest series which has yet been reported; in addition he mentions other cases described in the literature.

It is most discouraging in the consideration of brain tumors that the pathology of such lesions is still chiefly one of malignancy, and, although Dandy uses the title of "Benign Encapsulated Tumors," the mere fact that the frequent cyst formations, designated as tumors in this series, are of multiple character in the individual patient, point to a malignancy of growth if not of cellular pathology. The end-result to the patient is usually the same. Even so-called benign endotheliomata have been known to recur after apparently complete removal and extirpation.

Dandy reports an operative mortality of only 35 plus per cent, which is

a very creditable achievement in this most dangerous operative field, and only one death in his last seven cases. As in all neurosurgical procedures, due to the pioneer work in this country of Cushing, Frazier and others, the operative mortality is fortunately a low one, but unless the ever-present high percentage of malignancy of brain tumors can be successfully overcome, the brilliant operative procedures will continue not to be the true story from the patient's or from the community's point of view; the end-results being the same in these cases of malignant intracranial lesions, *i.e.*, death after a period of at most several years of impaired personality to say the least. The permanent operative trauma to adjacent cerebral cells and subcortical tracts and association fibers must never be lost sight of in the rational consideration of the end-results.

WILLIAM SHARPE, M.D.

ERRATUM

Page 122 of the January, 1935, issue first line second word should read *Hexamethylenamin* (instead of *Hexylresorcinol*).

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EDITORIAL ADDRESS

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